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VOLUME 12 SEPTEMBER, 1947 NUMBER 3

A Philosophy of Speech Correction

Kenneth Scott Wood*

The speech correctionist, if he is to be effective, progressive, and whole-hearted, must have a working philosophy consisting of something more than the emotionally satisfying reactions which come from helping the handicapped. An immediate and short-range altruism in terms of single cases, although a powerful factor in providing a professional *raison d'etre*, is likely to waver under the criticisms which are frequently leveled at speech correction. Early in his training, the student clinician needs to develop a rational philosophy about speech correction which will give him an over-all sense of direction, relationship, and purpose. Without such an underpinning in his profession, he may suddenly find himself working in isolation with the speech mechanism, with speech sounds, and even with the individual. Because he does not have a broad enough concept of what he is doing and why he is doing it, he will eventually find himself operating in a vacuum where life becomes very dull. Like the person who has not only lost his way but his address as well, he will become disheartened and leave the field.

In any field of study or profession one cannot remain healthy unless he has a philosophy of justification for his pursuit and unless he can see where it fits in the great jig-saw puzzle. Such a philosophy must be devoid of rationalization. We should constantly be concerned with the justification for speech correction as a special field or as a facet of general speech education. Like many other academic fields speech correction is often criticized thoughtlessly without regard for evidence and from various motives. Unless these criticisms can be dealt with by a rational philosophy, their rhetorical effects may emotionally undermine the confidence one has in what he is trying to do.

I call attention here to the broader implications of speech correction which are sometimes overlooked in the university training program. I refer to the necessity of showing the student the solidity of the scientific approach to the study of speech, to the necessity of relating it for him to the entire field of abnormal behavior, and to the task of fitting it into other problems of learning and education. I would go so far as to say that if broader implications are kept in mind, the cluster of subjects generally designated as 'speech correction courses' affords the best opportunity we have of teaching what speech really is. The other important approaches to the study of speech and development of speech skill accomplish their ends more effectively when they constantly consider the contribution of speech correction as an indispensable part of the whole speech curriculum.

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Consider first the nature of speech correction. It is utterly dependent upon a thorough understanding of speech itself as a form of human behavior. To comprehend the speech act we must understand the person himself. Conversely, no person can really be understood apart from his speech. We may say that in every individual there is a vocal equivalent for every psychological state. These vocal equivalents are easily seen and heard in such states as fatigue, pain, intoxication, embarrassment, anger, and psychosis; they comprise a major part of the symptoms. The vocal counterparts of all mental and bodily states are not always easily detected, but they are present nevertheless. Every syllable uttered is in some way a reflection of the personality of the person who utters it.

A deviated or disturbed personality may be either the cause or the result of deviated speech, but the two always become coexistent. The work of a speech correctionist is therefore inextricably bound up with the dynamics of human behavior in relation to environment. To those whose thinking goes only as far as the tongue, teeth, lips, and palate, this concept has particular urgency. The speech correctionist is not merely a highly specialized mechanic devoting attention to a narrow group of muscles.

Speech correction is a direct avenue to the study of human behavior; and it is a scientific one. The study of language in the race or in the individual is tied up with the biological origin of man as a species together with the evolutionary development of his speech structures. Since it is produced through definite action of bodily parts, speech can be considered as physiological in mechanism; and the more primitive the language the more evident are its anatomical components such as the sucking-speaking movements in infants. Today after centuries of development, the more primitive and grosser movements such as gestures and grimaces are still used to heighten and intensify meaning. When we say that the purpose of speech is communication, we are talking about a flexible means of expressing attitudes, motivations, and needs, which make it possible to extend our desires, ideas, feelings, and knowledge to others. So it is that a philosophy of speech correction must include the basic concept that speech is biological in origin, psycho-physiological in mechanism, and predominantly sociological in function.

One of the salient features of speech correction is the natural systematic eclecticism which has resulted from the necessity for drawing together elements from so many fields: psychology, neurology, medical science, genetics, physics, physiology, education, and many others. To enter the field of speech correction is to immerse oneself in deeply significant aspects of human behavior and personality problems all of which are related to such fields as social case work, criminology, parent education, juvenile delinquency, clinical psychology, and educational methods. In troublous days like these when words fly fast, even our socio-political problems are better understood when we better understand the persons speaking. Not to be aware of these relationships is to be a speech correctionist without a perspective, without a philosophy, and without a dynamic point of view.

The great fear of anyone who specializes is that he may not go into the field for which he has prepared, but no thorough-going student of speech correction can ever count his time lost if he decides not to take it up professionally. It is not so highly specialized as is generally believed. Instead, it is a wide area of education which brings to a focus many tangent and allied fields which are probably better understood because of their specific applications to speech pathology. The same can be said for other areas of speech education, although their allied and tangent fields may not be so numerous.

A study of abnormalities and their remedies is often more productive in the development of principles and understanding than is the study of the normalities alone. The enlightenment we get from the pathologies helps us to know and cultivate the normal person. For example, developments in remedial reading have taught us much about teaching reading to everyone; and our knowledge regarding the function and structure of the normal brain cannot be achieved without the study of the defective brain. When we deal with speech deviations that are extremely noticeable, we devolve methods that are applicable to the normal deviate. That is to say, many of the problems of speech re-education are qualitatively the same as those of speech education, but in the former they are more acute. I cannot see that in trying to correct the substitution of one sound for another on the part of the child we are doing anything basically different from trying to improve the articulation habits of a college student of public speaking. It should be clear, however, that the principles we learn in helping the child train his ear, identify and recognize speech-sounds, and discriminate among sounds are more helpful in teaching public speakers than if we were concerned with the public speakers alone. Our work with speech defective children has taught us a great deal that can be applied through parent education for the actual prevention of such defects.

We are always faced with the problem of differentiating at all levels the abnormal from the normal. The discerning speech correctionist soon finds that there is a little of the abnormal in every normal speaker and normal aspects in all our defective ones. The stability, accuracy, and organization of the normal speaker is on the upper end of a continuum from those of the defective speaker, but even then such qualities fluctuate toward either end of the scale in accordance with the reactions of the individual to situations. The problem of the stutterer is in part the same problem that the fluent speaker has in experiencing stagefright when speaking in public. The main difference is that the stutterer is affected markedly by ordinary situations while the normal speaker is not. The work of the speech correctionist, then, is not detached from all other forms of speech education, but is a remedial and developmental approach in which there is intensified method for stimulating speech growth and in which normal speech is a constant point of reference.

In a sense teachers of drama, public speaking, and radio are speech correctionists too, although they are concerned in addition with goals that lie further on. For that reason they are no more detached from the interests of speech correction than speech correction is from them.

It has been said that speech correction is bulging and overbalancing the speech curriculum because we are expanding clinical programs together with the equipment, courses, and cases essential to the training of personnel. A study of university catalogues does not reveal over-balancing in terms of numbers of courses offered, staff members or equipment. Budget studies show that the heaviest equipment purchases are in drama and radio. I suspect that the natural activities of the speech correction program are more noticeable to the general public because of the reaching out for cases from the schools, doctor's offices, and homes. Any program will attract attention when it involves not only university students, but parents, children, and others who are seen coming to and going from the clinic. The speech correction program should be developed until the need for its work is met. Surveys agree that at least 10 per cent of the public school population have speech defects; and every university teacher deplores the inarticulateness of his students.

We have been told that speech correction establishes a pattern of mediocrity in education because it is aimed

at helping the inferior individual. Because a child or student is inferior in speaking does not mean that he is inferior in all other respects. He may and often does have great potentialities in such areas as art, physics, law, business, and politics. Here the speech correctionist can perform a real service to society by making him more articulate. It would be time wasted, of course, to attempt to correct the speech of the mentally deficient. There is no case for them as far as speech correction is concerned unless it be a matter of securing speech improvement up to the level of intelligence. But as for the accusation with which we are confronted that speech correction penalizes the fit by drawing so much attention to the unfit, I pose this question: Is it any less important for our social world to raise the inferior speaker up to a normal level of performance than to lift the normal speaker still higher?

Some of the skeptics outside and inside the field have said: 'The trouble with speech correction is that it does not correct.' Such a statement is usually born in the spirit of conversation as fashionable cynicism. One might as well say: 'The trouble with our schools is that they do not teach; and the trouble with medicine is that it does not cure.' These statements are generalizations without evidence. Let no speech correctionist ever doubt that speech defects can and are being corrected. Symptoms are often stubborn and deeply rooted, but where enough factors are alterable, normal speech can be attained or permanent improvement secured. Let the people who make such statements study the research; let them confer with the medical doctors who are members of the American Speech Correction Association; and let them visit and observe over a period of time in the clinics and in the schools where the work is being done.

Of course, there are many cases which are never solved, but these are offset by the thousands of cases which are completely rehabilitated. There is no doubt that speech correction procedures do sometimes fall short of their goals. We still have much to learn. It is the same in other speech areas and in medicine. How many students of public speaking become effective speakers, and how many drama students become skilled actors? Naturally a constant re-examination of methods and results is healthy, but a professional field cannot take seriously such an unqualified statement as the one cited.

One of the problems in working with cases is the clinician's anxiety over progress. Clinicians and parents are sometimes so progress-conscious that they imagine an immediate improvement after each clinical hour; and the clinician often tries to demonstrate such progress by putting the child through his paces for the parent or other observer. Progress in speech correction takes time. It is a matter of growth and not a sudden result of a manipulation.

University clinics have been criticized on the score of devoting too much time to research, but no matter where he works the speech correctionist's philosophy should impel him to seek new knowledge and new methods which will improve the profession. His eyes and ears and mind must be open while he works. Research involves systematic observation of symptoms, causes, and results of procedures in the cases with which we work. Even the public school correctionist should take time to compile data about cases for the purpose of drawing conclusions and letting others know about them through publication.

A clinic is not getting the most out of its work if the clinicians are not observing the collective significance and effects of therapy and reporting them. For any kind of advancement anywhere we must have research. We can philosophize only so far, and then we have to have evidence. A university clinic should have as its purpose the training of speech

correctionists, the rehabilitation of cases, and the carrying on of research. These three are interdependent. In professional life, every correctionist should have the same type of philosophy: to develop himself further, to help speech defectives, and to be wide awake in observing collective results.

The importance of the scientific attitude in the philosophy of speech correction cannot be over-drawn. Because one has been using a certain method or has held certain beliefs for a period of time, it is not a disgrace for him to give them up and change to something else if he thinks he has good reasons. The disgrace belongs to him who espouses pet theories and interprets every attack on them as an attack on his person. The speech correctionist must hold himself in readiness to benefit from all the thinking and findings of other workers and to disavow or modify his theories when their validity is refuted. The study of human behavior is fluid; there is much to learn yet, and it is expected that thinking men will change their minds. There is bound to be disagreement. Let us make sure, however, that the clash of opinion and research will be on a higher plane than the clash of temperaments and personalities.

If there were nothing else to recommend the study and practice of speech correction than the humanity involved, it would still be supremely worth the effort. As a people with a democratic philosophy we collectively wage war against disease, ignorance, poverty, crime, disaster, and their after-effects; we are concerned with our total welfare. Like other handicaps a speech defect too is crippling and disabling. It disqualifies the person from competing for the security he wants and from expressing himself as he would like. The happiness he would get from optimal expression is impaired. The effects of his abnormality are diffused and ramified throughout his whole personality, and he finds he cannot modify the behavior of others without depreciating his own sense of well-being and feeling of being at ease. The gnawing inner pain of being different results in a series of chain reactions which often serve to wreck the individual.

In serving the individual speech correction serves society, but first comes the individual. The school child is thrust into a group situation, with the expectation that he will become one of the group, but his speech is unintelligible or he stutters. What is to become of him if someone does not help him to fill in the gaps and to get ready to meet the strenuous demands of his environment? He is engaged in a struggle to be normal, but unless his specific needs are met as soon as possible he will fall further and further behind.

Speech correction occupies a strategic place in the whole field of education because it is concerned with key problems of the individual. Its philosophy is that every individual is worthwhile and that his speech is the most important tool he has for getting along in life. Whatever we do for his speech, that we do also for his whole being.

The important thing is that the speech correctionist must have a rationally sustained belief in his work. He should not become professional by accident. He must have well-conceived purposes, a direction of movement, an awareness of relationship to other professions, and a determination to get results.

FORMAL CALL FOR PAPERS

American Speech Correction Association

1947 ANNUAL CONVENTION — DECEMBER 29, 30, 31, 1947

SALT LAKE CITY, UTAH

The Program Committee will continue to receive for examination until November 1, abstracts of papers and addresses proposed for a place on the program of the 1947 meeting of the Association. Three general types of materials will be considered:

1. Theoretical or experimental papers on speech or hearing disorders.

2. Practical papers or techniques for the rehabilitation of speech or hearing disorders.

3. National, State, or City programs for the rehabilitation of speech or hearing disorders.

The Committee will operate under the rules set down in the Constitution of the Association.

All abstracts must be received by the Committee by November 1, 1947. In addition to summarizing the paper, each abstract must indicate (a) the time required for presentation, (b) details on the type of visual or audio aids which will be needed, and (c) other requirements. The full name and the professional affiliation of the author should be indicated.

Receipt of an abstract will be taken as evidence that the person submitting it is aware of the following rules governing the conduct of section meetings:

1. All meetings will begin when scheduled.

2. Chairmen will, without exception, hold speakers to time limits on papers, addresses and discussions.

3. As in the past, copies of all papers and addresses are to be collected by chairmen of section meetings, who will submit these manuscripts to the Editor of the *Journal of Speech Disorders*.

The Committee will welcome suggestions from members regarding nonmembers who can contribute significantly to the program. Such recommendations are to be transmitted to the Committee through a Fellow of the Association.

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JOURNAL OF SPEECH DISORDERS, 1947, **12**, 263-266

Hypothyroidism, Basal Metabolic Rates and Cleft Palate In Hawaii

Florence M. Henderson*
Henrietta C. Krantz

Because the etiology of cleft palate has been and still is largely a matter of conjecture, almost any information regarding possibly related factors is important. Consequently, Krantz (**7**) has attempted to answer several questions that have been raised in connection with Henderson's (**4**) report of a high incidence of the defect in Hawaii.[1] In that article, which was prompted by Brown's (**1**) hypothesis that there is a positive correlation between frequency of cleft palate and incidence of hypothyroidism, Henderson stated that the iodine content of potable Hawaiian water is great enough to render doubtful frequent occurrence of hypothyroidism in the Territory. Later, during a conversation with one of her readers, this statement was challenged, and a further question was posed as to whether hypothyroidism might not be more common than she inferred. In addition to investigating the possibility that Henderson might have been mistaken on these two points, Krantz has also attempted to discover whether there is any correlation between the high rate of cleft palate and low basal metabolic rates that are frequently observed in Hawaii, a relationship that Henderson had also declared doubtful. Following is a report of the findings relative to (a) dietary sources of iodine, (b) incidence of hypothyroidism, and (c) relationship between low metabolic rates in women and frequency of cleft palate in offspring.

[1] This article and the following article (pp. 267-278) represent the greater part of a thesis submitted in partial fulfillment of the requirements for an M.A. degree at the Univ. of Hawaii by Henrietta C. Krantz.

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I

As for potable water, neither the Territorial Board of Health nor the Board of Water Supply has available data on its iodine content because there has never been sufficient question about its adequacy to justify analysis for this particular chemical. Studies made at the University of Hawaii, however, relative to the iodine in air, foods, and potable water in the Territory report amounts sufficient for physiological needs.

Hammond (**2**) made analyses of samples of tap water from Honolulu and Aiea and found an average iodine content of between one and two parts per billion of water for each place, an amount that in his opinion represents a safe non-goiterous water. He also examined a large sample of air from over Oahu and found an iodine value of 5.6×10^{-7} parts per billion. This is significant as a source of iodine to inland soils and thence to plants.

Investigation of foods in the Territory produced results that bear further testimony to the adequacy of

iodine for human needs. Hammond reported iodine values for ten representative fruits and vegetables known to Honolulu markets. Iodine contents in terms of parts per billion of dry weight were found to range from 45.8 for peeled papaia to 300-400 for poi, which is made from taro root. A study of 27 samples of Hawaiian meats and poultry, made by Shinkawa (9) disclosed a high iodine content for all samples, the organs of the animals containing a higher amount than the flesh. Investigations of fish and seaweed by Harry (3) revealed large amounts of iodine comparable to those obtained in marine products elsewhere.

According to these reports, then, there is sufficient iodine in Hawaiian diets to prevent thyroid dysfunctions that might be occasioned by iodine deficiency.

II

Probably because of its rarity, the writers were unable to find in scientific literature on local physiological conditions any mention of hypothyroidism as an Island problem. Pursuing the matter further, however, they made inquiries of several prominent physicians who had been practicing in the Islands for many years. These men ventured opinions that the frequency of either hyper- or hypothyroidism in Hawaii is very low.

Although hypothyroidism is rare, two local studies, whose findings have previously been reported by Henderson (4), tell of frequent instances of low basal metabolic rates, but in neither one is the cause attributed to hypothyroidism. Rather, they are considered typical of populations of warm regions that are located near the sea.

In one of these studies, Miller and Benedict (8) compared the basal metabolic rates of subjects of both sexes from five of the larger racial groups. In the analysis of their data, they list the following average percentage deviations from the Harris-Benedict prediction:

Men

Caucasian	— 6.7
Part Hawaiian	— 6.1
Chinese	— 5.3
Japanese	— 2.8
Chinese-Hawaiian	— 2.4

Women

Chinese	—15.0
Chinese-Hawaiian	—13.7
Japanese	—10.8
Caucasian	— 7.8
Part Hawaiian	— 7.4

Taking into account that basal metabolic rates are usually sub-standard in tropical climates, the authors interpret their findings as follows:

> If we use as a basis of comparison the average percentage deviation from the Harris-Benedict standard noted with the Caucasians in Hawaii, we find that the groups of men all show percentage deviations, on the average, essentially of the same order of magnitude as the Caucasians. Hence, among the men there is no evidence of a racial factor on the basis of comparison. With the women, on the other hand, it is clear that if the percentage deviation shown by the Caucasians is used as a basis of comparison, the 21 Chinese, the 16 Chinese-Hawaiians, and the 23 Japanese all have a metabolism definitely lower than the Caucasians.

Referring to the Chinese and Chinese-Hawaiian women, these authors conclude that 'even if due allowance is made for the admitted belief that the American standards for women are 5 per cent too high, there is still evidence that these groups of women in Hawaii have a basal metabolism appreciably lower than the corrected American standards.'

III

Since a search of the literature failed to provide any information on the frequency of cleft palate in tropical regions other than Hawaii, the only cue to further investigation of the problem was the possibility that the incidence of cleft palate in the offspring of mothers of various ancestries might be correlated with the deviations from normal in basal metabolism of mothers in the respective racial groups. In other words, if the presence of low metabolism is accountable for the high rate of cleft

palate in Hawaii, one might expect mothers from those racial groups that have the lowest metabolic rates to produce more cleft palate children than mothers from other groups with higher rates. Accordingly, this study was made.

The data used were obtained from the birth certificates and the registrations of cleft palates in the files of the Territorial Board of Health in Honolulu. They consisted of the total number of live births for each of the five maternal groups listed by Miller and Benedict and the number of cleft palate children born to the respective groups during the five-year period from January 1, 1947 to January 1, 1942. These data together with the percentages of cleft palate are reported in Table 1.

TABLE 1. Cleft palate rates in offspring from mothers of various racial ancestries.

Maternal ancestry	*Live births*	*Cleft palates* No.	% ± SE
Caucasian	5,819	3	0.052 ± .030
Chinese	2,665	2	0.075 ± .053
Japanese	16,815	28	0.167 ± .031
Chinese-Haw'n	2,323	6	0.258 ± .105
Part Hawaiian*	4,419	18	0.407 ± .098

*This group contains all the Hawaiian blends for the five-year period with the exception of those that contain a Chinese component and those listed only as Part Hawaiians. The latter group was omitted because it is possible that it contains some Chinese-Hawaiians.

Because of the infrequency of cleft palate, the numbers of live births are too small to yield reliable percentages except in the case of the Japanese, for whom there were 16,815 births. Consequently, any conclusions drawn from comparisons should be surveyed with this fact in mind.[1]

Reliabilities of the differences in cleft palate rates for various paired races are shown in Table 2. If a probability of .02 is accepted as highly indicative of a real difference, we may say that in four instances there is evidence that maternal groups from different races vary in respect to the rate of cleft palate in offspring. They are Caucasians and Part Hawaiians, Japanese and Part Hawaiians, Chinese and Part Hawaiians, and Cau-

TABLE 2. Reliabilities of differences in cleft palate rates in offspring from maternal groups of various racial ancestries.*

Maternal ancestry	*Live births*	*Cleft palates*	χ^2	*P*
Caucasian	5,819	3	17.54	< .001
Part Haw'n	4,419	18		
Japanese	16,815	28	9.22	< .01
Part Haw'n	4,419	18		
Chinese	2,665	2	6.5	< .02
Part Haw'n	4,419	18		
Caucasian	5,819	3	6.42	< .02
Chinese-Haw'n	2,323	6		
Caucasian	5,819	3	4.17	.05
Japanese	16,815	28		
Chinese	2,665	2	2.44	.20
Chinese-Haw'n	2,323	6		
Chinese	2,665	2	1.26	.30
Japanese	16,815	28		
Japanese	16,815	28	0.97	.50
Chinese-Haw'n	2,323	6		
Chinese-Haw'n	2,323	6	0.94	.50
Part Hawaiian	4,419	18		
Caucasian	5,819	3	0.18	.70
Chinese	2,665	2		

* The test used here was the χ^2 test of homogeneity given by Hoel (5), not the commonly used Chi-square test. *P* as used here refers to the probability that the groups compared represent the same populations.

[1] It is almost impossible to secure very much more extensive data on the blended groups because the regulation requiring the registration of cleft palates was initiated only in September, 1936, and in July, 1940, the method of classifying Part Hawaiians was so changed as to make it difficult to isolate the Chinese-Hawaiians accurately. This change was in effect during the last nineteen months of this study, but Krantz went to considerable lengths to eliminate any error that it might introduce. Besides breaking down the classification 'Part Hawaiian' into its definite racial components wherever the information was available, she eliminated the 441 Part Hawaiians who could not be more accurately classified. This was done because of the possibility that some of these might be Chinese-Hawaiians and also because the one cleft palate child born to this group might have had a Chinese-Hawaiian mother.

TABLE 3. Racial groups ranked according to their obtained positions in the two categories: metabolic rates and cleft palate rates.

	Chinese	*Chinese-Hawaiian*	*Japanese*	*Caucasian*	*Part Hawaiian*
Metabolic Rates (lowest to highest)	1	2	3	4	5
Cleft Palate Rates (highest to lowest)	4	2	3	5	1

casians and Chinese-Hawaiians. One can only conjecture that larger groups might reveal other significant differences.[2]

In order to investigate the possibility of a correlation between metabolic rates in mothers and cleft palate rates in offspring, the racial groups were ranked according to their obtained positions in these two categories, as shown in Table 3. The rank correlation coefficient is .291, and the probability of obtaining such a small coefficient when the two sequences are correlated is .342, according to Kendall (**6**, 397).

IV

Perhaps the conclusion to be drawn from data limited by (a) the unreliability of percentages of cleft palate, (b) only marginal differences in metabolic rates, and (c) the assumption that the metabolic rates for racial groups are typical of the corresponding maternal groups, can best be couched in the negative, thus: There is no evidence in this study that the high rate of cleft palate in Hawaii is due to low basal metabolic rates in mothers. It is possible that more extensive data on both metabolic rates and cleft palate frequencies might reveal some correlation, but, in view of other findings that will be reported in a later article, the writers now believe that there is no such correlation.

[2] The fact that cleft palate rates are markedly higher for the two blended groups than for the unmixed races led Krantz to make an intensive study of the possible relationship between the racial composition of maternal ancestries and incidence of cleft palate. [The results of this study are presented in the second article on pages 267-278 of this issue of the *Journal*. —*Editor*.]

SUMMARY OF CONCLUSIONS

1. There is sufficient iodine in potable water and local foods in Hawaii to prevent thyroid dysfunctions that might result from iodine lack.

2. Hypothyroidism is so rare in Hawaii that it cannot be considered a cause of the high rate of cleft palate in the Territory.

3. There is no evidence in this study that the high cleft palate rate in Hawaii is due to low metabolic rates in mothers.

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Relationship Between Maternal Ancestry and Incidence of Cleft Palate

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IN A PREVIOUS study made by one of the writers (**6**), the frequency of cleft palate in Hawaii was compared with frequencies reported by Brown (**2**) for Wisconsin and New Jersey. According to the statistics used, cleft palate is almost twice as frequent in Hawaii as in Wisconsin and four times as frequent as in New Jersey.

In an effort to discover whether there is any support in Hawaii for Brown's conjecture concerning a positive correlation between cleft palate and hypothyroidism, Krantz (**7**) undertook a study the nature and results of which are reported elsewhere. Following a certain cue in making that study, she gathered data on the racial ancestries of mothers but not of fathers. In the course of evaluating her data, she discovered apparent relationships between incidence of cleft palate and racial composition of maternal ancestries. Consequently, because she developed the present study from the data she had already so laboriously secured, only maternal ancestries are considered here.

Definitions

For the sake of ease in expression, certain terms will be used with the meanings given below:

1. *Cleft palate*: Cleft palate, harelip, and the combination of cleft palate and harelip.

2. *Cleft palate child*: A child having one of the deformities mentioned in 1.

3. *Race*: This term will be used to designate Caucasians and Negroes, to whom *race* in its broad sense is commonly applied, and also such national and island groups as the Japanese, Portuguese, and Filipinos, each of which is united by consanguinity and distinguished from other groups either by long geographical or political and cultural isolation, or by both. Hawaiians, although Americans, will be considered a separate race. National groups such as the French, Roumanians, and Greeks, all of which are customarily classified as Caucasians, will in general be united into one group and referred to as Caucasians.

4. *Maternal ancestry*: A mother's racial lineage.

5. *Unmixed ancestry*: Maternal ancestry that is reportedly from a single racial group as defined above.

6. *Blended ancestry*: Ancestry that contains components from two or more racial groups, such as Caucasian-Chinese or Portuguese-Hawaiian-Korean.

Source And Classification Of Data

The data for the study were obtained at the Territorial Board of Health in Honolulu. They consist of the total number of live births in the Territory and the number of children born with cleft palate during the five-year period studied, together with notations as to the maternal ancestry of each child. The period covered extended from January 1, 1947 to January 1, 1942.

One of the most difficult problems encountered was the classification of ancestries. Since to describe the process with all of its difficulties would require many pages, only the most pertinent points will be summarized here.

The first problem was the delimitation of Caucasians, for anthropolo-

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gists are not in complete agreement on the matter. It was finally decided to follow Webster's (**14**) segregation of national groups that make up the Caucasian race, with two exceptions, viz., the Portuguese and the Spanish. This liberty was taken in order to conform with the subdivisions in use at the Territorial Board of Vital Statistics at the time this study was initiated. This procedure seemed particularly justified in the case of the Portuguese who make up what is considered one of the large racial groups in the Islands and among whom are many persons whose ancestry undoubtedly contains components from northern Africa. To a certain extent the Spanish in the Territory also merit isolation from the Caucasians, for in many instances they have come from islands and from Central and South American countries where their ancestral background is likely to have become mixed. Consequently, although these two groups were treated as unmixed, they were not included as Caucasian.

The second question was whether to classify Puerto Ricans as an unmixed or a blended group. According to the United States Census for 1940, the population of Puerto Rico is 76.2 per cent white and 23.8 per cent Negro. Since the term *Puerto Rican,* therefore, might mean a representative of the white race or one of the Negro race, or a mixture of the two, it was decided to classify them as blends. This seemed the better procedure, for it appeared probable that the very classification as *Puerto Rican,* rather than as *Caucasian* or *Negro,* indicated a mixture.

Third, and most troublesome, was the introduction of a new system of classifying ancestries on birth certificates in July, 1940, nineteen months before the close of the period covered in this research. This change was made in order to conform with the Sixteenth Decennial Census of the United States, 1940. In the revised regulation, each birth was to be recorded as one of the following: Hawaiian, Part Hawaiian, Caucasian, Puerto Rican, Chinese, Filipino, Japanese, Korean, and All Others. This appeared to cause little difference in the manner of recording thereafter except for the Caucasians, Portuguese, Caucasian-Portuguese, and the Hawaiian blends. Since, in accordance with the revised rules, all Portuguese were to be listed as Caucasians, and all Hawaiian blends as Part Hawaiian, the notations on parental ancestry were less definitely designated, and it became necessary in many cases to turn to the family names of the mothers if the researcher was to secure the classifications she desired. In many instances, however, it was impossible to reclassify the ancestries in these groups.

Although some errors were unavoidably introduced for these nineteen months, it seemed better to use the larger numbers provided by coverage of the full five years than to discard all data for these months. Consequently, Krantz (**10**) arrayed the figures by years and, through inspection for marked changes in birth rates, arrived at estimated corrections, which are reported in Tables 2, 3, and 4.

These changes had no effect on the identification of ancestry of the cleft palate children, for this information was gathered from detailed records filed at the Bureau of Crippled Children. In one instance, however, no more definite classification than *Part Hawaiian* was given in these records. Consequently, some one or more groups of blends other than the Hawaiian should contain one more cleft palate case.

Evaluation Of The Data

In Table I, live births and cleft palate cases are compiled on the basis of unmixed and blended ancestries as recorded by the Bureau of Vital Statistics. Since, because of the infrequency of cleft palate, any sample of fewer than 1000 births can scarcely be considered adequate for even an exploratory study, the six large unmixed racial groups, viz., Caucasian,

Table 1. Distribution of live births and cleft palates according to maternal ancestry.

*Maternal ancestry**	*Unmixed*	*Blended*	*Cleft palate*	*Maternal ancestry*	*Unmixed*	*Blended*	*Cleft palate*
As.H.Cau.		1		F.P.Sp.		8	
Cau.	5819		3	F.PR.		34	
Cau.C.		31		F.PR.Sp.		2	
Cau.C.F.H.		3		F.S.		1	
Cau.C.H.		408	2	F.Sp.		38	
Cau.C.H.In.		2		Fi.	3		
Cau.C.H.J.		1		Gal.	1		
Cau.C.H.Sp.		1		Gil.	1		
Cau.C.Sp.		1		H.	3851		6
Cau.F.		28		H.In.		11	
Cau.F.H.		6		H.J.		231	
Cau.F.S.		1		H.J.P.		3	
Cau.F.Sp.		2		H.J.Sp.		1	
Cau.H.		2955	12	H.K.		86	
Cau.H.In.		15		H.K.P.		2	
Cau.H.J.		51		H.K.Sp.		2	
Cau.H.K.		4		H.Mao.		1	
Cau.H.M.		2		H.M.		3	
Cau.H.P.		24		H.Ne.		1	
Cau.H.Sp.		7		H.P.		609	3
Cau.H.T.		2		H.P.S.		1	
Cau.In.		21		H.P.Sp.		4	
Cau.In.M.Sp.		1		H.PR.		15	
Cau.J.		38		H.PR.Sp.		1	
Cau.J.P.		3		H.S.		17	1
Cau.K.		16		H.Sp.		139	
Cau.K.Sp.		1		H.T.		3	
Cau.Ne.		1		Pa.H.		441	1
Cau.P.		138	2	In.M.		1	
Cau.PR.		11		In.PR.		1	
Cau.S.		37		In.Sp.		1	
Cau.Sp.		22		In.Sp.PR.		1	
C.	2665		2	J.	16,815		28
C.F.		22		J.K.		10	
C.F.H.		12		J.P.		18	1
C.F.H.Sp.		3		J.PR.		1	
C.F.Sp.		1		J.S.		1	
C.H.		2323	6	J.Sp.		6	
C.H.In.		1		K.	490		
C.H.J.		25		K.P.		13	
C.H.K.		9		K.PR.		3	
C.H.M.		3		K.Sp.		12	
C.H.P.		61		M.	1		
C.H.S.		2		M.P.		1	
C.H.Sp.		33		M.Sp.		1	
C.H.T.		1		M.Sp.P.		1	
C.J.		12		Ne.	2		
C.K.		1		Ne.P.		1	
C.M.		1		Ne.PR.		2	
C.P.		29		P.	3262		8
C.PR.		9		P.PR.		36	
C.Sp.		10		P.PR.Sp.		1	
C.Sp.Cu.		1		P.S.		1	
Cu.	1			P.Sp.		28	
Cu.Sp.		1		PR.		1253	1
F.	4249		15	PR.Sp.		50	
F.H.		214	2	S.	39		
F.H.I.		2		S.Sp.		1	
F.H.Ne.		1		Si.	1		
F.H.P.		1		Sp.	140		
F.H.Sp.		9					
F.J.		4		Total unmixed		37,340	62
F.K.		2		Total blended		9813	31
F.M.		2					
F.P.		86		Grand total		47,153	93

*As recorded at the Bureau of Vital Statistics. Abbreviations: As.—Asiatic, C.—Chinese, Cau.—Caucasian, Cu.—Cuban, F.—Filipino, Fi.—Fijian, Gal.—Galatian, Gil.—Gilbertese, H.—Hawaiian, In.—American Indian, J.—Japanese, K.—Korean, Mao.—Maori, M.—Mexican, Ne.—Negro, P.—Portuguese, Pa.H.—Part Hawaiian, PR.—Puerto Rican, S.—Samoan, Si.—Siberian, Sp.—Spanish, T.—Tahitian.

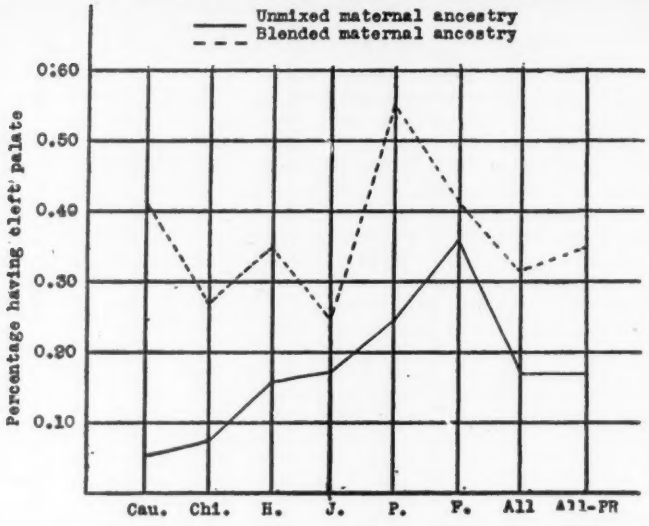

FIGURE 1. Maternal Ancestries. Percentages of cleft palate in children of various mixed and blended maternal ancestries.

Chinese, Filipino, Hawaiian, Japanese, and Portuguese, have been singled out for special study. In addition, blended ancestries, of which one of the components is from one of these six groups, have been assembled in order to find the number of Caucasian blends, Chinese blends, etc.[1] The percentages of cleft palate for all of these groups are given in Table 2.

Groups of fewer than 1000 have been used in two ways. First, as shown in Table 2, they have been included in the totals. This was done in order to take into account all races and blends in addition to the six groups and their blends mentioned above and also to make use of as large populations as possible. In order to estimate a possible error in counting the Puerto Ricans as blends, both 'total blends including the Puerto Ricans' and 'total blends excluding the Puerto Ricans' have been used in making comparisons. Second, two small groups of blends—the Japanese with 407 live births and the Filipinos with 481—have been treated just as the larger groups, the purpose being to discover to what extent the findings would support the trend for the larger groups.

The graph of obtained percentages shown in Figure 1 suggests that cleft palate rates (a) vary for offspring from mothers of different unmixed ancestries, (b) vary for offspring from mothers of different blended ancestries, and (c) are greater for offspring from mothers with blended ancestries than for offspring from mothers with unmixed ancestries. These rates range from 0.05 per cent for Caucasians to 0.35 per cent for Filipinos, and from 0.25 per cent for Japanese blends to 0.56 per cent for Portuguese blends, the relative difference being much smaller for the blended groups. Perhaps most significant of all is the fact that in every instance there is a higher rate for the blends than for the corresponding unmixed group.

[1] It should be understood that any blend in which the components come from two or more of the six large racial groups has been counted two or more times, according to the number of components. For instance, a Caucasian-Filipino has been counted as both a Caucasian blend and a Filipino blend.

Are these real differences or merely chance variations? And even if they are found to be statistically significant, may they not have resulted from some accidental factor such as discrepancies in reporting cleft palate cases, or the chance presence in some groups of an occasional family that tends to produce cleft palate children? The second question may well be answered first.

As for discrepancies in reporting, we may suppose that both physicians and midwives are quite reliable in registering instances of the defect, for the regulation governing the registration of deformities imposes a penalty on the person who is responsible for filing the report but fails to do so. It seems unlikely that a doctor would jeopardize his position by either careless or willful negligence in the matter or that a midwife, who in Hawaii must receive a permit each year in order to practice, would take the risk of losing her means of livelihood.

If non-professional attendants are negligent in making reports, we might expect such failure to occur in low-income groups where trained attendants are less likely to be employed. This would mean that people in unskilled laboring classes, which in Hawaii are composed largely of races other than the Caucasian, would be the most likely to err. We should therefore expect the Caucasians to have more nearly accurate records than most other racial groups and as a consequence, if there actually are no differences in cleft palate rates, to exhibit a higher incidence of the defect than most other races. Since the reverse is true, we may conclude that if there was any failure in registering cases, the results of this study have probably been prejudiced in favor of those races for whom the observed rates are the highest and consequently the relative pattern of racial differences has not been changed thereby.

Familial tendency toward cleft palate, as evidenced by siblings, is limited directly to one family included in this study and indirectly to another. Three children with the defect were born to one Hawaiian family within the period covered by this research, and two such children have been born to one Caucasian family, but one of them was born after the period studied. More distant relationships, such as cousins, have not been traced.

Table 2. Cleft palate rates in offspring from mothers of various racial ancestries.

Maternal ancestry	*Recorded* live births*	*Cleft palates*		*Corrected live births*	*% ± SE*
		No.	*% ± SE*		
Caucasians	5819	3	0.052 ± 0.030	5646	0.053 ± 0.031
Chinese	2665	2	0.075 ± 0.053		
Hawaiian	3851	6	0.156 ± 0.064		
Japanese	16,815	28	0.167 ± 0.031		
Portuguese	3262	8	0.245 ± 0.087	3417	0.234 ± 0.083
Filipino	4249	15	0.353 ± 0.091		
Total unmixed	37,340	62	0.166 ± 0.021	37,322	0.166 ± 0.021
Cau. blends†	3834	16	0.417 ± 0.104	3984	0.401 ± 0.100
Chi. blends	3006	8	0.266 ± 0.094	3173	0.252 ± 0.089
Haw'n blends	7748	27	0.348 ± 0.067		
Jap. blends	407	1	0.246 ± 0.245		
Port. blends	1068	6	0.562 ± 0.229	1086	0.553 ± 0.225
Fil. blends	481	2	0.416 ± 0.293		
Total blends (including Puerto Ricans)	9813	31	0.316 ± 0.057	9831	0.315 ± 0.056
Total blends (exluding Puerto Ricans)	8560	30	0.350 ± 0.064	8578	0.350 ± 0.064

* For a discussion of the difference between recorded and corrected live births, see CLASSIFICATION OF DATA.

† Each blended group contains all of the mixtures in which the given component appears. **See Table 1.**

If two cleft palate births are deducted from the Hawaiians as a possible compensation for the family strain, they then have a percentage of 0.104 with a standard error of 0.052, but their place in the racial sequence based on obtained percentages is not changed thereby. Instead, it is more definitely established, for the previously indistinguishable difference between their rate and that for the Japanese has been considerably increased, although it is not yet significant.

From the foregoing discussion it appears that if the obtained differences in cleft palate frequencies are found to be statistically significant, they may be construed as indicating racial variations in either exogenous or endogenous factors that might cause the defect. The next question, then, is: Are these differences real?

Unfortunately, because of the rarity of cleft palate, not all of the samples are large enough to provide reliable statistics. The effect of small samples and of infrequency of the defect can easily be detected when one inspects the standard errors (Table 2). Only the Japanese and the total groups have enough live births to yield reliable percentages in spite of the low cleft palate frequencies, and only the Filipinos, the Caucasian blends, and the Hawaiian blends have

Table 3. Reliabilities of the differences between cleft palate rates in offspring from maternal groups with different unmixed racial ancestries.*

Maternal ancestry	*Recorded† live births*	*Cleft palates*	χ^2	*P*	*Corrected live births*	χ^2	*P*
Caucasian	5819	3	12.55	<.001	5646	11.99	<.001
Filipino	4249	15					
Caucasian	5819	3	6.47	<.02	5646	4.81	.05
Portuguese	3262	8			3417		
Japanese	16,815	28	5.76	<.02			
Filipino	4249	15					
Chinese	2665	2	5.14	.05			
Filipino	4249	15					
Caucasian	5819	3	4.17	.05	5646	3.82	.10
Japanese	16,815	28					
Hawaiian	3851	6	3.03	.10			
Filipino	4249	15					
Caucasian	5819	3	2.70	.10	5646	2.55	.20
Hawaiian	3851	6					
Chinese	2665	2	2.51	.20		2.31	.20
Portuguese	3262	8			3417		
Chinese	5819	2	1.26	.30			
Japanese	16,815	28					
Japanese	16,815	28	.96	.50		.69	.50
Portuguese	3262	8			3417		
Chinese	2665	2	.84	.50			
Hawaiian	3851	6					
Portuguese	3262	8	.70	.50	3417	.89	.50
Filipino	4249	15					
Hawaiian	3851	6	.41	.70			
Portuguese	3262	8			3417		
Hawaiian	3851	6	.22	.70			
Japanese	16,815	28					
Caucasian	5819	3	.18	.70	5646	.14	.80
Chinese	2665	2					

* The χ^2 test of homegeneity given by Hoel (8)—not the commonly used Chi-square—and *P*, the probability that the groups compared represent the same populations, were used.

†For a discussion of recorded live births and corrected live births, see CLASSIFICATION OF DATA.

TABLE 4. Reliabilities of the differences between cleft palate rates in offspring from maternal groups with different racial ancestries.*

Maternal ancestry	*Recorded† live births*	*Cleft palates*	χ^2	*P*	*Corrected live births*	χ^2	*P*
Caucasian	5819	3	15.63	< .001	5646	14.47	< .001
Cau. blends	3834	16			3984		
Hawaiian	3851	6	3.21	.10			
H. blends	7748	27					
Portuguese	3262	8	3.19	.10	3417	2.68	.20
P. blends	1068	6			1086		
Chinese	2665	2	2.92	.10			
Chi. blends	3006	8					
(Groups with fewer than 1000 children of blended maternal ancestry.)							
Japanese	16,815	28	0.15	.70			
J. blends	407	1					
Filipino	4249	15	0.004	.98			
F. blends	481	2					
Tot. unmixed	37,340	62	8.19	< .01	37,322	9.05	< .01
Total blends (including Puerto Ricans)	9813	31			9831		
Tot. unmixed	37,340	62	11.42	< .001	37,322	11.85	< .001
Total blends (excluding Puerto Ricans)	8560	30			8578		

* The χ^2 test of homogeneity given by Hoel (8)—not the commonly used Chi-square—and *P*, the probability that the groups compared represent the same populations, were used.

†For a discussion of recorded and corrected live births, see CLASSIFICATION OF DATA.

frequencies high enough to overcome the limitation in size of samples. One can only speculate on the results that might be obtained from larger groups.[2]

Because so many of the samples are small, any technique for determining the reliability of differences between paired rates is likely to be biased in the outcome. In order to reduce this bias to a minimum, the χ^2 test of homogeneity[3] given by Hoel (8) was applied, and the results are reported in Tables 3 and 4.

If a *P* of 0.02 or less is accepted as evidence that the populations are very likely different in respect to the occurrence of cleft palate, then it may be said that Japanese and Filipinos—two unmixed groups of which the samples are representative—and the total unmixed and total blends have different cleft palate rates. And with some reservation because, as pointed out above, the sample of Caucasians is too small to guarantee reliability of the observed percentage of cleft palate, one may say it is highly probable that there is a real difference between the rates for Caucasians and Filipinos and for Caucasians and Caucasian blends. In any event we may conclude that in Hawaii (a) cleft palate rates differ for some unmixed races and (b) cleft palate is more frequent in offspring from mothers of blended ancestry than in offspring from mothers of unmixed ancestry.

Comparisons of rates for specific

[2] For certain groups these samples are practically as large as any that can be obtained, for, as explained earlier, the system of classifying ancestries on birth certificates has been so changed as to make it impossible to identify all representatives from certain racial stocks, particularly Caucasians, Portuguese, Caucasian blends, Portuguese blends, and all blends that involve a Hawaiian component with the exception of the Hawaiian blends.

[3] This is a much more sensitive test than the Chi-square that is commonly used.

blends is impossible, for there are only two samples of over 1000 live births, Caucasian-Hawaiians and Chinese-Hawaiians. Although the ratio of cleft palates for these groups is 8 to 5, the Caucasian-Hawaiians having the greater frequency, the difference is not statistically significant.

Interpretation of the Findings

It now appears that the comparatively high rate of cleft palate in Hawaii is somehow linked with the racial composition of the population of the Territory, for not all races exhibit the same rates. The key to the problem seems to be the fact that offspring from mothers of blended ancestry are more likely to have the defect than offspring from mothers of unmixed ancestry, which is confirmed by the ethnology of the so-called unmixed races.

According to Zaide (**15**) the Filipinos are a hybrid race of people composed of many fractions. He states that the proportions of racial bloods, as given by ethnologists, are Negrito, 10 per cent; Indonesian, 30 per cent; Malay, 40 per cent; Hindu, 5 per cent; Chinese and Japanese, 10 per cent; Arab, 2 per cent; and European and American, 3 per cent. The last is of comparatively recent intrusion, having been introduced in the sixteenth century and thereafter. At best these are only approximations, but they show graphically the admixture of black, brown, yellow, and white peoples that is known as Filipino. Caucasians, on the other hand, though widely distributed, do not contain many color fractions. Consequently, the great difference in cleft palate rates for these two groups may also be an index of the relative difference in color blending.

Another bit of evidence pointing in the same direction is the fact that when the unmixed Caucasians are compared with the Caucasian blends, the difference is sufficient to suggest that in the process of ancestral blending there has been some change in heritable factors that have either modified the nutritive systems of the mothers or the developmental processes of the offspring. In contrast, there seems to be only a slight difference between the rates for Filipinos and Filipino blends, both of which are greatly mixed.

Portuguese mothers, next to the highest in rate of cleft palate in offspring, also come from a mixed race. Taft (**13**), in a thorough study of the racial composition of the Portuguese, points out that in Portugal there are several distinct racial types that vary from an almost complete identity with the pure Iberian to a definite mixture of Caucasian and Negro bloods. He states that the earliest intermixture is buried far in the past, but more recently, in the fifteenth and sixteenth centuries, the Negro element has increased with the importation of slaves from Africa and the consequent easy intermarriage between the whites and the blacks. He mentions another fact important to this study which is that the emigrants are mostly laborers who originated in Southern Portugal and the insular possessions where the Negroid element is the most pronounced. Since it was the need for laborers that first brought this people to Hawaii, we may assume that in the blood of many of the present inhabitants is a mixture of the white and black color factors.

The rather marked difference between 0.25 per cent cleft palate births for Portuguese and 0.56 per cent for Portuguese blends, both from mixed ancestries, may possibly be accounted for by the introduction of the yellow and brown factors in the blends, as specific instances reported in Table 1 show. It is also obvious, however, that the white component is still a markedly disturbing element as shown by the occurrence of 2 cleft palates in 138 live births.

The racial fractions that cross the color lines in the Chinese, Hawaiian, and Japanese races are less obvious in ethnological reports. In a discussion of the origin of the Chinese, Gowen (**5**) states that some authorities main-

tain that the Chinese are autochthonous, having occupied their present abode since time immemorial. He himself goes on to say it is highly possible that in the great shifting of peoples caused by the influx of Semitic tribes into the Euphrates Valley about 4000 B. C., the Turanian civilization may have pushed far enough eastward to have influenced the peopling of the present northwest provinces of China. Whether there was such an infiltration from the west, however, is a point not agreed on by all authorities. Aside from the migration into Old China by peoples such as the Tibetans, Burmese, and Manchus—all of Mongolian extraction — the Chinese, so far as is known, seem to be a fairly homogeneous people.

In comparison with the Chinese, to whom the Japanese are closely related by origin, the Japanese are described by Webster (**14**) as descended mainly from the Koreans and Chinese who displaced the original inhabitants of the archipelago. According to Longford (**11**), the present race of Japan is probably descended from two types of colonists, one coming by way of Korea from the central plateau of Siberia and the other coming by way of Formosa from the southern part of the continent. The latter are thought to be of Malay origin. Although several racial classes exist in Japan, it is supposed that these peoples mixed rather readily and that in the lower stratum there was also some intermingling even with the original inhabitants of Japan, the Ainu. Most authorities agree that the Malay fraction is present in the Japanese, but they are not so well agreed as to the origin of the northern immigrants. In any case, the Japanese seem to represent a considerably greater mixture than the Chinese but also a very old mixture.

The origin of the Hawaiians, known as Polynesians, is also somewhat a matter of conjecture. One of the most comprehensible descriptions of their probable racial make-up has been given by Buck (**3**) who says:

> The ancestors of the Polynesian people are held by most scientists to have been a Caucasian off-shoot which worked east from south of the Himalayas and reached the islands of the Malay archipelago known collectively as Indonesia. There they came in contact with the Mongoloid ancestors of the Malays who had pushed south into the same region. A certain amount of the intermixture took place, followed by conflict which resulted in the push east into the Pacific of the mixed Caucasian-Mongoloid people. This mixed people, largely Caucasian and to a lesser degree Mongoloid, formed what are now termed the Polynesians (**3**, 19-30).

If this account of the beginning of the Polynesians is correct, we find an ancient mixture of white and oriental peoples vested in the Hawaiians who for centuries lived in almost complete isolation from other migrating peoples.

Bringing together the probable fractional composition of the six large racial groups (see Table 5) as presented in the foregoing analysis, we find an interesting picture as it is related to the sequence based upon observed cleft palate rates.

Although some of the places in the first sequence cannot be argued to be accurate beyond a doubt, it does seem meaningful that the Caucasians and Chinese who rival each other for racial purity should show cleft palate rates so close in value; and that the Hawaiians and Japanese whose probable racial fractions do not differ markedly should compete for third and fourth places; and that the Portuguese and Filipinos whose composition involves the widest differences in color fractions and also recency of fusion should be separated from the preceding pair by quite a gap. In view of this fact and of the consistency of the total pattern revealed in the study, it seemed justifiable to compute the rank correlation coefficient for the two series. This coefficient was found to be 0.943, and the probability of obtaining a smaller coefficient if the two series are uncorrelated is 0.999, according to Kendall (**9**). Consequently,

TABLE 5. Probable fractional composition of the six large racial groups in Hawaii.

Order based on obtained percentages of cleft palate in offspring.	*Order based on fractional composition of maternal stocks.*
1. Caucasians (0.0515%)	1. Largely white
2. Chinese (0.0751%)	2. Largely yellow
3. Hawaiians (0.1558%)	3. Probably white, yellow, and brown, of ancient fusion
4. Japanese (0.1665%)	4. Probably yellow and brown, of ancient fusion
5. Portuguese (0.2452%)	5. White and black, of recent fusion
6. Filipinos (0.3530%)	6. Black, brown, yellow, and white, with the white added recently

it may be concluded that the incidence of cleft palate is correlated with the number and age of fusion of color fractions in the maternal ancestry.

Informative as this may be, it does not yet explain why the two should be related. Reviewing some of the postulated etiologies (**1**), one might ask whether the differences in cleft palate rates can be due to the physiological effects of racial diets, or to varying racial reactions to tropical climate. Can they be attributed to racial differences in nervous stability, or in endocrine activity? Or do they merely indicate that certain heritable factors in given stocks do not combine well with factors in other racial stocks?

Referring to cleft palate and allied anomalies, Beatty (**1**) says, "We do know that these defects are not due to . . . malnutrition." No doubt this statement is based on the widespread knowledge that cleft palate is no respecter of economic status, for it makes its appearance in families of both the undernourished and the seemingly well-fed. But this fact alone is not an irrefutable argument, for much food is no longer considered a guarantee of proper food. In view of present beliefs, however, and of the fact that frequency of the defect increases with the blending of maternal ancestry, it seems highly doubtful that malnutrition, which might be characteristic of some racial diets, can be the cause of racial differences in cleft palate rates.

As for the physiological effect of climate, the fact that Caucasians, the most transient of all peoples in the Islands, have fewer cleft palate children than other races might suggest this possibility. The fact, too, that in Hawaii average basal metabolic rates for women tend not only to be low for all races, which is characteristic of tropical regions near the sea, but also to vary from race to race (**12**), makes one suspicious of the systemic effect of climate on mothers. Following this cue, Krantz (**7**) investigated the possibility of a correlation between metabolic rates for racial groups of women and incidence of cleft palate in offspring and found no evidence of such a relationship. That finding, and the fact that cleft palate increases with complication of maternal ancestry, lead to the conclusion that racial variance in respect to cleft palate is not due to varying physiological reactions to climate.

Little can be said as to the relative nervous instability of racial groups, for this quality is practically unmeasurable as a racial trait. As a matter of casual observation, however, one would hesitate to class the Hawaiians as more unstable than the Caucasians, for the former are generally credited with unusual composure and equanimity, attributes not so characteristic of the Caucasians. But, of course, the frequency of marked cases of nervous instability is not easily estimated without careful observation. Consequently, one can only say that, without more evidence to be drawn

from the specific ancestral lines of the cleft palate cases, it is doubtful that cleft palate rates are correlated with varying degrees of nervous instability of races. And even if it were found to be so, we should still have the problem of accounting for an increase in nervous instability with blending of ancestry.

The question of whether cleft palate rates may be due to varying racial susceptibilities to endocrine dysfunctions cannot be easily answered because so little is known about the incidence of endocrine conditions generally and about their relationship, if any, to cleft palate. At this point we can only state that there is no obvious evidence that such a relationship exists, at least not in Hawaii, but this possibility would seem to deserve study. One point on this subject that should be mentioned, however, is that the rarity of hypothyroidism in the Islands (**7**) indicates that if thyroid deficiency is correlated with cleft palate, as Brown suggests, there must be some additional etiological factor to account for the high rate of the defect in Hawaii.

Do these findings indicate that some heritable factor or factors in given stocks do not combine well with factors in other racial stocks? To the writers an affirmative answer to this question seems the most logical conclusion to be drawn from the exceptionally consistent picture of increase of cleft palate with increase in complexity of maternal ancestry, even though not all differences in cleft palate rates have been found to be statistically significant.

In a splendid review of the literature, Gates (**4**, 817-824) points out that geneticists are not only still wide of agreement as to number, penetrance, recessiveness, and sex-linkage of genes that carry cleft palate, but also that they are not completely agreed as to whether the genic expression is direct or indirect, i.e., whether the route of influence is directly from gene to cleft palate or from gene to the nutritive system of either the mother or the embryo and thence to the palate. In any event, the fact that cleft palate occurs in offspring with no known history of color crossing leads to the conclusion that whatever the nature of the underlying heritable factor, its phenotypic expression is only enhanced, not determined, by racial crossing. Possibly the penetrance of the determiner is increased.

Whether the genetic factor modifies the nutritive system of the mother or actually passes on to the embryo is a question on which some light might be shed by a study of the relationship between paternal ancestry and the incidence of cleft palate. For the present, however, one can only say that the embryo is more likely to encounter developmental difficulties that result in cleft palate when the maternal ancestry involves divergent color fractions.

Summary of Conclusions

1. The comparatively high rate of cleft palate in Hawaii is due to the racial composition of the population of the Islands.

2. Tendency toward the production of the cleft palate children is positively correlated with the number and recency of fusion of color fractions in maternal ancestry.

3. Whatever the actual etiology of cleft palate, it seems to be carried, in some instances at least, as a transmittable genetic factor whose phenotypic expression is augmented as a result of racial blending in the maternal ancestry.

Recommendations

1. This study should be extended to include more cases in order to establish more definitely actual differences in cleft palate rates. Unfortunately, as pointed out before, it would be very difficult to gather much more extensive data for certain races because the present system of classifying ancestries on birth certificates precludes accurate identification of Caucasians, Portuguese, and blends in which there is a Hawaiian component. A study

of other groups, however, could readily be made.

2. A study of the relationship between paternal ancestry and incidence of cleft palate should be made in order to determine whether the relationship between cleft palate and degree of blending in ancestry is due to a heritable factor that affects only the nutritive system of the mother or to one that is transmitted to the child through the genes. If a positive correlation should be found, the presence of a genetic factor that is inherited by the child would be indicated. If no correlation were found, a modification of the nutritive system of the mother would probably be indicated.

3. In order to determine whether cleft palate occurs more often in children born to parents of relatively pure but different stocks than in children born to parents of the same stock, a study should be made of the offspring from the union of Chinese and Caucasians as compared with the offspring from Chinese parents and Caucasian parents, respectively.

4. Studies similar to this one and to those mentioned above should be made relative to incidence of other deformities such as clubfoot, webbed fingers and toes, and extra digits.

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A Velopharyngeal Exercise

Frances M. Brown*

BECAUSE plastic surgery is at present more widely available than it was 15 or 25 years ago, there is a tendency for greater numbers of children with cleft palates to receive the benefits of surgery at an earlier age. Thus we can start speech training at an earlier period in the child's life, and because many of our cases are younger, our methods and approach to the rehabilitation of post-operative cleft palate speech are in need of considerable revision. They must be somewhat dressed up or down. It seems we must now color our techniques with more durable dyes that will not fade in a long period of exposure.

Surely when we are presented with a three-year-old whose palate repair is completed, the job of speech therapy is not brief. Even before it is started, we must usually deal with parents who are in need of helpful understanding and motivation to assist with therapy. The average parent (whom none of us has met) is limited in his ability to perform intricate and elaborate speech training and supervision at home. At least this is true of most of the several hundred parents of children with repaired congenital clefts with whom the author has worked. Yet, if the speech retraining is to proceed in the most rapid and effective manner, much work at home must supplement the clinician's work. The author feels it is highly important to use techniques which are adaptable in a wide variety of ways. Most parents will be much more successful if given a few clearly-understood principles on which to operate.

A simple device which meets these requirements is the nose cap, which was devised to facilitate work with young children at home and in the clinic, and which is easily understood in its use. In our clinic its variations are as yet unended. It is the result of attempts to create an interesting and, when necessary, a game-like situation for blowing exercises, and one which can readily be grasped by the parent. The oft-recommended use of two small sheets of paper with two pieces of cotton, one held at the mouth and the other at the nares, proved to be impracticable. Neither the child nor his parents were interested for long. In their complaints they said it was 'bunglesome,' 'hard to hold and use,' 'can't see what we're blowing,' 'not interesting,' etc.

To meets these objections, the nose cap was devised. It is constructed as follows: Cut or tear a piece of paper 1.5 inches wide and 2.5 inches long. (The length varies with the width of the nose.) Fold a right-angled triangle on each of the short sides as shown in Figure 1. Make a second fold at each end, parallel to the long sides of the paper, and running from the apex of each triangle to the middle of its hypotenuse. Then paste or clip these folded ends over, so that the paper resembles a toy boat or a paper drinking cup. This makes a cap to cover the nares. The dots in the folded figure indicate holes through which string may be tied so that the nose cap is secure over the nose, with the strings tied behind the head, as one would tie a mask.

The child may now begin attempts to blow objects, i.e., small tufts of cotton, crumpled one inch squares of paper, paper snow flakes, etc. A primary incentive is here furnished because one may start with small cut-outs which can be considerably increased in size without too great an

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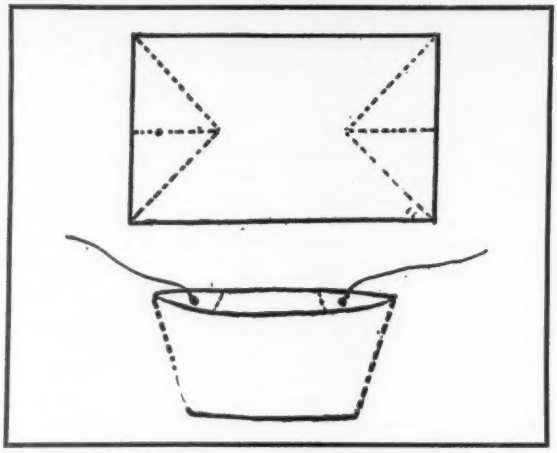

FIGURE 1. Directions for constructing a nose cap: (above) dotted lines indicate indicate folds which are made in the paper, (below) the loose folds on the inside of the finished nose cap are pasted or clipped to one side, and strings are fastened to the double-thicknesses.

increase in the amount of breath force necessary to move them. They may also be placed at varying distances on the blowing surface from the child's mouth.

Parents are shown how to make and use the nose cap. They are told that it is useful because it does not artificially force the breath stream through the mouth. If the cap is properly fitted, air may come through either the nose or the mouth, but the nasal stream of air is diverted so that the objects to be blown will move only if air is coming through the mouth. Incorrect use of the nose cap is also demonstrated, on the theory that people should not only know what to do but what not to do. They are advised to present the nose cap at a time when the child appears receptive and accustomed to game or play periods. If there are no siblings who can play the blowing game with the child, the parents should wear nose caps and sit across the table from him, blowing cotton, feathers, bits of paper, back and forth. In this way essential encouragement is provided, the child is not isolated to exercise alone, and the blowing exercises for control of the breath stream become an interesting, socialized play situation.

It is obvious that the nose cap does not keep air from coming through the nose. Only by proper use of the child's own speech mechanism can air be made to come through the mouth. There is no artificial forcing of air through the mouth, such as occurs with the use of nasal olives, pinching the nares shut with the fingers, etc. Such artificial blocking of the nasal breath stream does not strengthen the muscles of the naso-pharynx, and consequently is ineffective in improving voice quality for everyday speaking.

The nose cap has proved useful with adolescent and adult post-operative cleft palate cases, too. All cases who use the nose cap are advised to begin with silent blowing. It is useful to have the patient continue to wear the nose cap during later work in which sounds, nonsense syllables, words and rhymes are spoken while blowing objects. The nose cap has proved a valuable tool in the development of increased activity of the naso-pharyngeal sphincter, which is an essential part of the speech rehabilitation of the post-operative cleft palate patient.

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The Rationale of Blowing Exercises For Patients With Repaired Cleft Palates

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PALATAL exercises based on blowing have long been a stock procedure in the speech training of patients with repaired cleft palates. The purpose of this article is to present certain general principles that the writer believes are basic to the proper understanding and use of such exercises. A check of all issues of the *Journal of Speech Disorders* since its inception reveals that only ten articles dealing specifically with cleft palate have been published, and of these only four are concerned primarily with the problem of speech training.[1] Certain of these articles, as well as textbooks and other publications in the field, provide excellent lists of specific blowing exercises and games. No attempt is made here to duplicate or add to these lists. Although this article is limited rather closely to a consideration of the *rationale* of blowing exercises, there is no intent to minimize the value of other types of palatal exercises or to overlook the relatively small part played by such procedures in the whole program of speech training, not to mention the surgical, dental, social and educational aspects of the problem. The discussion is centered on cases with repaired cleft palates but it is in part applicable also to other types of organic nasality. Blowing exercises are considered with special reference to the soft palate, but the value of other types of palatal exercises and the importance of pharyngeal movement are fully recognized.

The Dual Purpose of Blowing Exercises

The obvious aim of blowing exercises is to 'exercise' the muscles of the soft palate and adjacent structures having to do with the closure of the opening into the nasopharynx. The underlying assumptions are: (1) that through such exercise the patient will learn better voluntary control and hence improve use of the palatal muscles, and (2) that there will be an actual strengthening and development of the muscles themselves thus making possible a more extensive contraction. The first of these assumptions seems well founded clinically by virtue of the improvement often noted following a regime of such exercises. The second is logically probable but more difficult to establish.

A less obvious purpose that is sometimes overlooked is to teach the patient to direct the air stream through the mouth. We are dealing here with the *idea* of mouth direction rather than physical ability or inability to blow efficiently. Even the child born with a normal palate has to learn the trick of blowing through the mouth and normally this achievement is acquired with or without parental encouragement sometime between one and two and one-half years of age. For obvious reasons children with cleft palates often do not develop this ability spontaneously with the result that, as speech is acquired, it is even more defective than the palatal deficiency would necessitate because of the lack of the basic concept of the oral direction of the air stream during

[1] These articles are listed as references at the end of this article. References **1**, **9**, **11**, **12** and **14** are worthwhile related articles.

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phonation. It should be further noted that the repair of the palate at 1.5 to 2.5 years of age by no means insures that the child will automatically acquire the knack of directing the air stream orally, even though his physical ability to do so is much improved.

Exercise Versus Motivation

It should be remembered that exercise occurs only when a muscle moves, i.e., in blowing, when the palatal muscles contract. Blowing inevitably exercises the muscles of breathing but not necessarily those of the palate. With both the nasal and oral ports open, it is quite possible to force air out through the mouth without any 'exercise' of the palate taking place. It further seems probable that this sometimes happens when blowing exercises are carelessly prescribed or inadequately supervised. Since efficiency in blowing is directly related to the degree to which the palatal and pharyngeal muscles contract to block off the nasopharynx, blowing exercises are valuable only in so far as they *motivate the patient's effort to make the utmost use of these muscles.* Hence exercises that offer variety, competition, tangible checks on progress, etc., are desirable.

When Should Blowing Exercises Be Given?

The answer, of course, varies with the purpose of the exercises and the status of the individual case. Training in directing the air stream through the mouth should begin as soon as the child is old enough to grasp the idea, which may be any time after approximately nine months of age. It should not be postponed until after the palate has been repaired surgically. There is much to be said also for the value of pre-surgery training designed to stimulate movement in the un-united portions of the cleft soft palate, since it is believed that this develops the muscle tissues somewhat and tends to result in better palatal movement following the repair. However, it is doubtful if blowing is nearly as effective in this respect as massage and the natural acts of yawning, sucking, swallowing, etc.

Exercises for the purpose of developing, strengthening and improving the use of the palate following its repair should be started as soon as possible after the surgery, which means as soon as the surgeon feels that the tissues are healed firmly enough to withstand the strain. Usually this is at least a month following the repair and may be more depending on the conditions of the particular operation. Undue postponement of exercises following surgical repair seems unfortunate since it allows the patient time to fix habits of non-use of the repaired soft palate.

Easy Versus Difficult Blowing Exercises

Exercises to teach the idea of oral emission of air should involve only easy and relaxed blowing such as blowing out a candle or blowing a feather or ping-pong ball across a table. Blowing against pressure, as in blowing up a balloon, should be avoided since control and direction of the air stream, not strength of effort, is desired. Blowing designed to exercise and strengthen the muscles should be graded in difficulty so as to permit easy success occasionally, success with effort frequently, and at the same time provide new exercises slightly beyond the patient's current ability. Difficult blowing that is far beyond the patient's ability apparently does little good and may do considerable harm. *The violence of the breathing effort is no criterion of the value of the exercise.* Balloon blowing, for example, is best reserved for those patients who are already capable of a closure or near-closure of the opening into the nasopharnyx.

The Avoidance of Secondary Movements of the Nostrils and Lips

Apart from the possible psychological harm resulting from repeated failure, the main drawback of difficult blowing is that it encourages the development of undesirable move-

ments of the nostrils and upper lip as a part of the intense effort to prevent the escape of air through the nose. It seems probable that some children develop these movements in the absence of any special training in a self-initiated effort to prevent nasal emission. However there is no reason to doubt that they frequently result from ill-advised blowing exercises. When blowing exercises are to be given in the home, it is particularly important that the parents be instructed in preventing the occurrence of these accessory movements since they are much easier to prevent than to eliminate.

How Long Should Blowing Exercises Be Given?

The obvious answer that they should be stopped when maximum benefit has been achieved leads only to two other questions: Maximum benefit for what? How does one know when this point has been reached? In connection with the first question it should be pointed out that structural adequacy in one function cannot be taken *per se* as proof of adequacy for the performance of another function. For example, the ability to blow up a balloon without loss of air through the nose is not proof that the palate is structurally adequate for speech. The former calls for an intense muscular effort accompanied by a strong back-pressure of air in the mouth cavity; the latter must be accomplished with a minimum of effort and involves relatively low air pressures. Likewise, it is doubtful if the ability to sustain a vowel tone without nasality or loss of air is proof of physical ability (not to mention habit patterns) to close off the nasopharynx in casual speech, since the single contraction and relaxation in the former act is a far cry, neuromuscularly speaking, from the rapid changes in adjustment required in the latter.

The second question may be answered as follows: Maximum benefit, so far as blowing exercises are concerned, has been reached when the patient has full awareness of the concept of oral direction of the air stream, when he is able with ease to contract and relax the muscles of the palate voluntarily, and when he has attained the maximum degree of closure of the opening into the nasopharynx in terms of the structural and neuromuscular limitations of the soft palate and surrounding structures. The first of these items is a matter for subjective judgment. The second presupposes the first and can be observed more or less directly. The third presents a more difficult problem which is discussed in the following section.

Measuring Improvement in the Use of the Soft Palate and Adjacent Structures in Blowing

The problem of determining when maximum efficiency in the use of these structures has been reached is closely tied up with the problem of finding an adequate measure of improvement. In the first place it should be noted that measurements of the amount of nasality (if such were possible), or of the amount of air escaping through the nose, or of the amount expelled through the mouth cannot be taken as adequate indices of palatal efficiency. The relation of nasality to the nasal emission of air is to be discussed later. It should be clear at this point, however, that a decrease in the amount of air escaping through the nose may indicate either: (1) a decrease in the total amount of air expelled or (2) increased ability to stop the flow of air at the nostrils or (3) an increased ability to close off the nasopharynx. Similarly, an increase in ability to blow through the mouth may represent a general increase in vital capacity or either or both of 2 and 3 above.

It would appear then, that the only valid criterion of palatal efficiency is the amount of air escaping through the nose *in relation to* the amount emitted orally during the expelling of a given quantity of air. If this relationship is to be used for purposes of comparison, it is important that the total amount of air expelled and the length of exhalation be kept approximately constant since in blowing

against pressure the *proportion* of air escaping through the nose tends to rise as the breath pressure increases.

A somewhat rough but simple measure of this relationship can be made by using the wet spirometer which is designed to measure in cubic centimeters the total amount of air expelled. Preliminary practice in blowing into the wet spirometer with the nostrils held closed should be carried on until the total amount of air expelled remains relatively constant in successive trials. This should be followed by a short period of practice in blowing without holding the nose, making certain that there is no constriction at the nostrils (glass connectors may be inserted if necessary). Palatal efficiency can then be determined as follows: If on an average in three or four trials the patient is able to reach a spirometer reading of 1500 cc with the nostrils held closed but only 1000 cc with the nostrils left open, the muscles involved in the closure of the nasopharyngeal port may be said to be roughly two-thirds or 66 per cent efficient. Similar periodic determinations can be used to chart improvement.

Maximum muscular efficiency in closing off the nasopharynx can now be said to be reached when the improvement so charted reaches a plateau and remains there long enough to indicate little hope for additional improvement. Although this method has the merit of being at least somewhat objective, it still leaves unanswered the questions as to whether or not the best possible palatal exercises have been used and whether better methods might have stimulated greater pharyngeal movement. If perchance 100 per cent efficiency is achieved, it may be said with certainty that the palatal structure is completely adequate—for blowing the wet spirometer.

The Carry-Over Value of Blowing Exercises

No objective research on this particular matter has been found, but the writer's observations lead him to believe that there is relatively little direct and spontaneous carry-over into speech of increased palatal efficiency achieved as a result of blowing exercises. If correct, this means that ear training and specific drill in the nonnasal production of speech must follow or accompany such exercises if the best results are to be obtained. Spontaneous inprovement (in addition to the immediate post-surgery improvement) without benefit of palatal exercises has been noted in some cases in the period following a repair or elongation of the soft palate. It would appear that an improved use of the palate that is learned spontaneously is more likely to carry-over into all palatal functions, whereas improvement achieved through blowing is more likely to be specific for that act. However, there is considerable individual variation in respect to the degree of carry-over.

Blowing Exercises During Periods of Nose and Throat Infections

Because of the increased susceptibility of children with repaired cleft palates to upper respiratory infections and the possibility that the middle ear may become involved, it is unwise to continue blowing exercises if there is any sign of infection in the nose and throat.

Blowing Exercises and the Inadequate Palate

An inadequate palate may be defined for present purposes as one that is too short, too tense, too scarred, too deficient in muscle formation or innervation, or set too far from the posterior pharyngeal wall to afford any hope that even an approximate closure of the opening into the nasopharynx could be achieved with training. In such cases blowing exercises will be of little avail and are not recommended. It is not easy to decide in advance whether or not a palate is so inadequate structurally that attempts at muscle training would be a waste of time. Frequently repaired soft palates, which on casual observation appear quite inadequate perform surprisingly well. A trial period of training seems to be the only way to

resolve doubtful cases. In some instances however, the distance between the palate and the posterior pharyngeal wall is so great and the palate itself so short and tense that it is relatively certain that nothing can be accomplished. The observations to be developed in the following section also have a bearing on the problem of the inadequate palate.

The Relation of Nasality to the Nasal Emission of Air

Although there undoubtedly is a relationship between the amount of air escaping through the nose and the amount of nasality in the voice, it has long been known that this relationship is not inevitable or directly proportional. What is called nasality is a resonance phenomenon and can at present only be judged subjectively. The nasal emission of air is, however, quite a different matter and is capable of quantitative measurement. It is now generally accepted that some individuals *sound* nasal with no demonstrable escape of air through the nose and, conversely, that limited amounts of air can escape through the nose in phonation without causing nasality. The writer has observed several patients with wide, unrepaired clefts in the hard and soft palates (virtually making one resonance chamber of the oral and nasal cavities) who seemed, subjectively, to have less nasality than other patients whose palates were repaired but inadequate. Occasionally a patient wearing an obturator that covers an extensive cleft has been observed to show very little difference in the nasal quality of his voice with the appliance in place or removed—in fact, the quality sometimes appears better (before training) without the obturator.

It seems reasonable to assume that the closure, either surgically or with an appliance, of a large cleft has little if any effect on nasality if there remains an opening into the nasal cavity of considerable size that the patient cannot close. In relation to blowing exercises these observations mean that a 25 per cent increase in the efficiency of the palatal and pharyngeal musculature in preventing the escape of air through the nose during phonation does not mean at all that there will be a corresponding 25 per cent decrease in the amount of nasality present in the voice. A 25 per cent closure of a wide, unrepaired cleft would probably have no effect whatever on the apparent nasality; whereas 25 per cent of additional movement in a palate that lacked only one-fourth inch of making a complete closure might reduce the apparent nasality by 75 per cent.

To apply this point-of-view specifically to the problem of the inadequate palate let us suppose, as an example, a patient whose palate in the resting position is one inch from the posterior pharyngeal wall. On phonation the combined movement of the palate and the lateral and posterior pharyngeal walls reduces the size of the opening by one-fourth. We estimate that intensive exercises might increase the patient's ability by another fourth but no more. Are the exercises justifiable? Probably not, since there is no reason to believe that there would be any appreciable lessening of the nasal quality in the voice. It would appear that in this case it is the last quarter of the distance that really counts in making any appreciable reduction in the nasal quality. The figures used in this section are admittedly only roughly illustrative of the point under discussion.

Although outside the scope of this article, it may be noted in passing that these observations, if correct, have an important bearing also in estimating the probable result of surgery to elongate the palate and in determining the effect on speech of small openings remaining in the hard or soft palates following surgery.

Developing Pharyngeal Movement

The role of the pharyngeal muscles making up the lateral and posterior walls of the throat at the level of the soft palate and nasopharynx cannot be overlooked in any discussion of blowing exercises and palatal effi-

ciency. They are generally believed to play an important part in the closure of the opening into the nasopharynx. In obturator cases, or with patients where the repaired palate falls slightly short of adequacy, these pharyngeal movements may be the vital factor in determining the final results of speech training. The importance of stimulating additional movement of the pharynx at the level of the soft palate is frequently emphasized, but there appears to be few, if any, methods by which this movement can be *directly* taught or developed. In general it is hoped that blowing and other palatal exercises will also produce additional pharyngeal movement, but it is by no means certain that this actually happens with any regularity. Pharyngeal movements, sometimes extensive, occur in individuals with normal palates. Extensive movements are rather frequently observed in cleft palate patients who have had no special training, and they are occasionally seen in conjunction with an unrepaired or hopelessly inadequate palate. In the latter instance the effort seems to be of no avail so far as its affect on speech is concerned. Many puzzling questions arise: Why do some patients develop extensive pharyngeal movements apparently to no avail? Why do others develop such movements when they are seemingly not necessary to effecting a closure? Why do some individuals not develop such movements spontaneously, and seem unable to develop them with training? Are there structural deviations or psychological differences, or both, that account for the variation? To what extent is pharyngeal movement teachable and are there specific ways of developing it? These are important questions in the program of speech training for the patient with a repaired cleft palate and they are for the most part unanswered at present.

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JOURNAL OF SPEECH DISORDERS, 1947 **12**, 287-289

Infant Speech: Variability and The Problem of Diagnosis

Orvis C. Irwin*

In a previous article (**1**) the variability of infant speech sounds was presented in terms of the means and standard deviations of each of the fifteen distributions upon which developmental curves have been based. It was found that the distributions for phoneme type do not depart significantly from normal, but that only half of the frequency distributions are normal.

In order to handle the problem of variability of infant speech sounds adequately, a method which does not assume the normality of distribution in each of the age levels should be used. The median as a measure of central tendency and the percentile as a measure of dispersion meet this requirement. From a clinical standpoint, percentile curves lend themselves readily to diagnostic purposes. The following discussion, then, is based on the use of percentile curves and their equations.

I

In Table 1 will be found the phoneme type data organized according to the centile values, 10, 25, 50, 75, and 90. The table should be read: for the first age level (1 - 2 months) the number of subjects is 62, the number of records is 125, the 10th percentile is 4.8 phonemes, etc. The theoretical curves for each of these centiles are found in Figure 1. The equations for the five type centiles are listed in the following tabulation:

$$T_{C_{90}} = 13.0\ A^{0.331}$$

$$T_{C_{75}} = 10.3\ A^{0.339}$$

$$T_{C_{50}} = 7.1\ A^{0.501}$$

$$T_{C_{25}} = 5.3\ A^{0.562}$$

$$T_{C_{10}} = 4.0\ A^{0.615}$$

Since the symbol P has been used in previous reports for the term phoneme, to avoid confusion the symbol *c* has been substituted for the term percentile. Thus the first equation reads: the 90th type centile is equal to 13 times the age raised to the .331 power. It will be observed that para-

TABLE 1. Phoneme type variability among infants. Percentiles.

Bimonthly Age Group	Number of Subjects	Record	Centiles 10th	25th	50th	75th	90th
1-2	62	125	4.8	5.6	6.9	8.2	9.9
3-4	80	181	6.9	8.8	10.7	13.5	15.8
5-6	75	166	7.4	9.6	12.4	14.8	16.3
7-8	64	170	10.9	12.3	14.4	17.3	20.6
9-10	62	147	10.6	13.4	15.5	18.6	21.3
11-12	62	149	11.2	14.3	18.5	22.6	26.4
13-14	57	127	11.9	15.4	17.8	23.1	25.8
15-16	55	128	14.3	16.8	19.4	24.3	27.6
17-18	50	106	15.2	17.8	21.2	24.2	27.0
19-20	41	84	15.9	18.9	23.0	26.8	29.5
21-22	37	68	16.2	20.1	23.3	26.4	28.8
23-24	31	52	20.1	21.9	24.6	27.1	28.5
25-26	32	51	20.6	22.7	26.5	28.8	30.4
27-28	24	41	18.9	23.0	26.9	29.5	31.8
29-30	19	27	23.5	25.3	27.0	29.8	31.0

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bolic arcs have been fitted to the new type data.

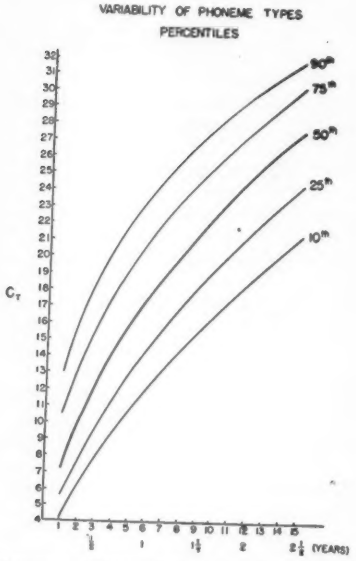

FIGURE 1. Theoretical curves for phoneme type variability at the 10th, 25th, 50th, 75th and 90th percentiles.

Figure 1 may be used to indicate the phoneme type status of an infant. It shows the values between which certain numbers of infants may be expected to fall. Thus 80 per cent of the cases fall between the curves based on the 10th and the 90th percentiles, and 50 per cent of them lie between the 25th and the 75th percentiles. An infant whose equipment of speech sound types places it in the middle 50 per cent then would be considered average in speech development. One who falls above the 75th percentile would rate above average and one who falls below the 25th might be considered below average. Likewise an infant which scored above the 90th percentile would be superior whereas one which was below the 10th percentile probably would be diagnosed as retarded in development.

To illustrate, suppose a sample of a two year old infant's speech is secured, and the number of phoneme types in the sample is determined. Suppose that the sample consisted of 15 phoneme types. Entering the grid at 2 years on the x axis and reading up on the y ordinate to 15, it is seen that the value falls below the 10th percentile. If the sample were an adequate one, it would indicate a substantial degree of retardation. If on the other hand the sample contained 31 types, superiority would be indicated. If the sample was made up of 23 phonemes, the child would be diagnosed as average in his speech sound development.

A caution must be observed. In order to use these percentile curves for diagnostic purposes, the sample of speech sounds should be taken in the same manner as the samples on which the curves are based. Thus, sounds transcribed from each of 30 breaths should constitute the sample at a given visit to the home or clinic, and at least two such visits should be spread over a two-month period. The average of two or more visits should be at hand before the diagnosis is made. A diagnosis based upon an inadequate sample might do an injustice to the child, especially if it yielded a judgment of retardation.

TABLE 2. Phoneme frequency variability among infants. Percentiles.

Bimonthly Age Group	*10th*	*25th*	*50th*	*75th*	*90th*
1-2	49.9	53.3	57.7	66.1	73.3
3-4	53.7	59.5	66.4	73.8	82.7
5-6	60.6	65.1	72.5	81.2	90.4
7-8	60.4	65.8	75.1	84.5	98.1
9-10	65.0	68.7	76.0	88.7	103.0
11-12	68.0	76.6	90.2	103.0	121.8
13-14	62.9	72.8	85.9	103.3	117.4
15-16	68.0	81.8	91.3	103.3	115.8
17-18	76.0	82.7	97.4	110.0	122.0
19-20	76.3	83.7	94.1	107.4	116.8
21-22	77.4	87.5	102.6	123.8	138.4
23-24	84.8	94.1	110.8	126.6	159.0
25-26	94.8	101.5	129.5	167.0	196.5
27-28	103.0	108.3	132.0	162.0	202.5
29-30	107.7	118.3	148.3	190.1	200.0

Before a judgment of retardation is arrived at, more than two samples should be taken during a given two-month period.

II

An analysis of the frequency data in terms of percentiles likewise may be made. Table 2 contains these data. The values again are those for the 10th, 25th, 50th, 75th and 90th percentiles. Figure 2 shows the curves. The equations for these curves are included below.

$$F_{C_{90}} = 72\ e^{0.068}\ A$$

$$F_{C_{75}} = 68\ e^{0.067}\ A$$

$$F_{C_{50}} = 58\ e^{0.059}\ A$$

$$F_{C_{25}} = 54\ e^{0.050}\ A$$

$$F_{C_{10}} = 48\ e^{0.049}\ A$$

It should be noted that exponential functions have been fitted over the whole period of infancy to plot the frequency percentile curves. Figure 2 likewise may be used in the manner described above in connection with phoneme types for diagnostic purposes in the clinical or home situation to determine the phoneme frequency status of a young child.

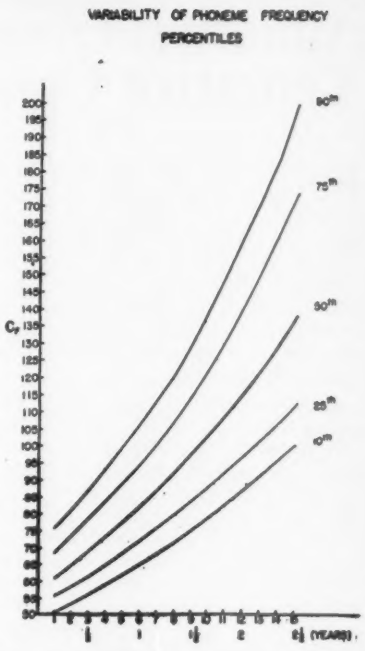

FIGURE 2. Theoretical curves for phoneme frequency variability at the 10th, 25th, 50th, 75th, and 90th percentiles.

SUMMARY

This is a report on the diagnostic use of percentile curves for both phoneme type and phoneme frequency in the speech of infants. Equations have been derived from the data and curves plotted for the 10th, 25th, 50th, 75th, and 90th percentiles. The diagnostic use of the curves is explained and illustrated. These curves should prove helpful to the clinician interested in problems of speech sound development and of retardation in the early years of life.

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Aphasics: Observations and Tentative Conclusions

Jon Eisenson*

For the most part, this paper will be concerned with observations and subjective clinical impressions growing out of the writer's experience with aphasic patients in Army hospitals. Although some figures will be presented, statistical treatment will not be attempted because the cases were too few in number to warrant the statistical approach.

Aphasic patients and especially young aphasics, whose disturbances are related to traumatic head injuries, are an inconsistent and unconventional lot, who show little evidence of what the textbooks indicate their behavior ought to be as a result of their injuries. First, the young aphasics observed showed no reliable correlation between type of language dysfunction and the site of their brain injury. Second, these patients showed no consistent relation between the extent of brain injury and their capacity to relearn language. Third, contrary to the findings in the writings of Kurt Goldstein and others, including the present author, the loss of capacity to abstract observed in civilian aphasics was by no means a general characteristic of the behavior of most aphasic patients in the Army. Inability to abstract was at most a strong feature of the behavior of some aphasic patients who tended to be among the older members of the group. Fourth, an average or higher pre-morbid intelligence was more frequently associated with aphasia and with the maintenance of aphasic disturbances than was below average intelligence. Fifth, pre-morbid personality traits of an undesirable nature were highly important factors which had to be considered in the retraining and recovery of the patients.

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I

In regard to the site of brain injury, there was only one consistent finding: When aphasic disturbances continued to be present three or four months after the incidence of trauma, it was noticed that the injured area always involved part of the contralateral brain hemisphere. It might be of interest to note, however, that in many cases right handed patients with right sided brain injuries had what appeared to be expressive disturbances of an amnesic or nominal type immediately following their injury. As a rule, the linguistic disturbances cleared up in a matter of a few days or a few weeks. In three or four cases, out of approximately 69 which were studied, right handed patients with right sided brain injuries began to stutter upon regaining speech and continued to stutter for a month or more after their injury. Other homolateral patients showed some residual speech difficulty in a general slowing down of responses. This behavior characteristic might very well be related to the anxiety picture presented by many patients with head injuries.

In regard to contra-lateral injuries, a knowledge of the site of the injury did not furnish any reliable clues as to the expected language difficulty. It was found, for example, that a few patients were dysarthric although they had no specific injury to the motor area of the brain or to peripheral nerves involved in articulation. Some of our patients with injuries in the dominant occipital lobe were nevertheless able to interpret visual impressions and it was found possible

to train them through the visual approach.

There are several possible explanations for these findings. One explanation is that by the time the patients were brought to hospitals in the United States the alternate brain hemisphere had taken over control of the initially disturbed function. A second explanation is that when trauma results from a high velocity missle piercing the skull, localization of injury is not possible. Although it is relatively easy to determine the point of penetration and the place of exit, the actual amount of brain destruction c a n n o t be determined through any present means of examination. There is little question also that the impact of the brain against the skull following penetration of a high velocity missle causes widespread and generalized brain injury as well as specific injury between the point of penetration and the point of exit. One might conjecture that in the event of wide-spread injury throughout a brain hemisphere, the alternate hemisphere is more readily able to assume dominance than is the case when the injury is localized. With localized injury in the dominant hemisphere it may be that the uninjured areas set up resistance and oppose the corresponding areas in the alternate brain hemisphere from taking over dominance and control. Still another thought along these lines is that dominance may not be a clear-cut matter for all cerebral functions but may vary from function to function. It may, for example, be possible for a left-eyed, right-handed individual to suffer less from the results of an injury to the left occipital lobe than would be the case with a right-eyed, left-handed individual.

Except in cases where the amount of brain injury was extremely great and involved both brain hemispheres, the extent of brain injury seemed to have little bearing on the patient's progress and improvement. One of the soldier patients had suffered approximately 25 per cent brain loss (left occipital and parietal areas). Despite this loss he had progressed from being an almost global aphasic to a point where he could speak with a fair degree of fluency, could write and copy from dictation and could read simple blueprints. In contrast with this patient, another with comparatively little know brain injury (left temporal area) had persistent and severe difficuties after more than a year of training. The second patient was discharged without ever having learned to recognize letters of the alphabet or to read or write without marked paraphasic errors.

II

Only two of 30 aphasic patients especially studied for loss of capacity to abstract showed any significant loss in this capacity. Of the two patients, one had rather wide-spread brain injury which included involvement of the left frontal lobe while the other patient's injury was in the left occipital lobe. What was observed frequently was an inability to express abstract concepts in the conventional manner. On the tests where the time element is involved, aphasic patients, in common with most brain-injured patients, tend to do poorly. They cannot verbalize their abstractions and so may have difficulty in defining words or in expressing their concepts in regard to verbal similarities. When they are permitted alternate or indirect means of expression, most aphasic patients appear to be able to abstract and to conceptualize fairly well. For example, one of my patients could not define the word 'tree' but was able to tell me, 'I can't tell you what it is, but one of them grows in Brooklyn.' Still another could not directly tell what the North Pole was though he was able to explain that 'It had something to do with a fellow who went to Japan.' For those of us who are unaware that the discoverer of the North Pole also opened up Japan for United States trade, the response would seem inappropriate and bizarre. With that awareness, the response is a very

meaningful one and on a fairly high level of abstraction.

III

The question of the relationship between intelligence and aphasic disturbances has been subjected to preliminary statistical study. A survey of 69 aphasic patients at two Army Neuro-surgical Centers showed their Army General Classification Test (A.G.T.C.) scores to be distributed as follows.

Grade[1]		
	I	— 5
	II	— 25
	III	— 25
	IV	— 13
	V	— 1

It will be noted that 55 of the patients were average or better in intelligence and only 14 were in the below average group. Further, 30 of the patients were above average and 5 of these 30 were superior compared with 13 in the low normal group and only 1 in the definitely below average group. On the basis of these figures one might conjecture that from the point of view of aphasic involvements associated with head injury, above average intelligence is something of a disadvantage.

Data on educational achievement tends to support this observation. A study of 64 aphasic patients for whom records were available showed the following distribution in regard to educational accomplishment:

Years of Education	
16 or more (college graduate)	3
13 to 15	4
12 (high school graduate)	23
9 to 11	18
8 (elementary school graduate)	9
6 to 7	6
less than 6	1

These findings are not surprising in the light of what we know about the correlation between intelligence and educational achievement.

IV

A study of the pre-morbid personality traits of aphasic patients suggests that there is a psychological overlay which influences the presence and nature of aphasic disturbances. Subjectively, I am inclined to believe that those of our aphasic patients who showed severe expressive disturbances were for the most part withdrawn individuals prior to their head injury. Red Cross social service histories tend to support this belief. Withdrawn individuals made slow progress and needed constant psychological support in the course of their training. On the other hand, persons whose histories revealed so-called extrovertive tendencies appeared to make rapid improvement. They 'took chances' more often than did the introvertive type of patient and were less embarrassed by errors in their speech. One other subjective evaluation may be worthy of note. Several of the patients were involved in accidents about which they felt guilty; one was suspected of negligence. In these instances, little spontaneous improvement took place and the aphasic disturbances tended to persist despite early efforts at training. At best, progress was laborious and slow and generally inconsistent with the patient's rate of physical improvement. These patients were recommended for intensive psychiatric treatment including narcosynthesis. It was not possible to make much head-way without this aspect of treatment.

V

These observations, as indicated, are tentative. Some may be no more than clinical hunches. They will be checked and compared with the findings of other clinicians and with the findings on veteran patients whose training is being continued under the jurisdiction of the Veterans Administration.

[1] The lower the grade the higher the test score. These grades roughly approximate intelligence groupings as follows: I= superior intelligence; II=above average intelligence; III=average or normal intelligence; IV=dull normal intelligence; V=below average intelligence.

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Spontaneous Versus Imitated Verbalization In Testing Articulation In Preschool Children*

Mildred C. Templin*

THE ARTICULATION of speech sounds is measured in spoken words or phrases, which can be elicited in a variety of ways. A measurement problem centers in the methods used to elicit speech sounds. Should the test words or phrases be elicited spontaneously or repeated in imitation of a pattern provided by the examiner? This is an important problem at the preschool, kindergarten and early primary levels. After proficiency is acquired in reading, articulation is easily tested by asking the child to read a simple passage aloud.

In previous studies the method used most often consists of showing the child pictures or objects designed to test specific sounds in the hope that he will respond spontaneously. The pictures or objects used must illustrate words within the child's vocabulary level. It is difficult to find words for sounds such as [ʃr] and [ʒ] which meet the criteria of good test words. In published research, whenever the investigator wished to measure such sounds, he furnished the child with an aural pattern, often a word outside the child's vocabulary. Williams describes the usual procedure: 'Photographic copies of pictures were used to elicit the desired words as spontaneously as possible. These were checked, when need arose, by having the child repeat the words after the examiner' (**11**). Many investigators (**7, 8, 10, 11**) ask the child to repeat one or two words which are difficult to illustrate. Henderson (**1**), in her study of institutional children, lists five words for repetition. In all studies, sounds measured in spontaneously elicited and imitated words are grouped together in the analysis.

Little experimental research is available on the influence of an aural pattern on articulation. The problem has been recognized by McCarthy (**5**) and Henderson (**1**). Morrison (**6**) presents some experimental evidence that articulation is similar whether or not a pattern to imitate has been presented. She tested the articulation of 218 kindergarten and primary children in words uttered spontaneously. In a second test, the 28 children found to have marked speech defects repeated after the examiner words containing sounds they had produced incorrectly. Practically none of the children corrected their speech sounds merely by having a pattern to imitate. This finding is in agreement with the experience of anyone who has attempted to correct articulatory errors.

The influence of a specific test word upon measured articulation is another problem of measurement. If measurement of a sound varies with the test word, then a *d* tested in 'duck' is a measure of the articulation of the initial sound only in the specific word. If measurement of the sound does not vary with the test word, then it is a measure of the general ability of the child to articulate the initial *d* in any word. In previous research specific sounds have been tested in one of several words, in a specific word, or in a chance word

*Miss Templin (M.A., Wisconsin) is an instructor in the Institute of Child Welfare at the University of Minnesota. This investigation in methods of testing speech-sound articulation is part of a longitudinal study of the development of articulation of preschool children which is soon to be published. The larger research is supported by a grant-in-aid from the Parents' Institute Research Fund of the Graduate School, University of Minnesota.

uttered during the examination. Poole (**7**), Wellman, *et al* (**10**), and Henderson (**1**) list several test words, the utterance of any of which is accepted as a test of the specific sound. Templin and Steer (**8**) and Voegelin and Adams (**9**) list single specific test words. Different words have been selected by different examiners.

In this study two specific questions are asked: (1) Is there any difference in measured articulation when a sound is tested in a word spontaneously uttered or in a word repeated after the examiner? (2) Is there any difference in measured articulation when the same sound is tested in different words?

Procedure

As part of a longitudinal study of development of articulation in the preschool child, children from the Nursery School of the Institute of Child Welfare, University of Minnesota, have been tested at six-month intervals since 1944. From these 100 children, 56 boys and 44 girls ranging in age from two years one month to five years nine months at the time of the first test, are included in this study. The mean C.A. for the total group is three years nine months with a standard deviation of 8.9 months. A total of 214 tests on these children is included: 100 are initial or first session tests; 77 are second session tests administered after six months to to children previously tested; and 37 are third session tests administered six months later. Separate analysis has been made for the first session tests. Of the tests, 122 are on boys and 92 are on girls. The ages of the children ranged from two years one month to six years three months at the time of testing. The mean C.A. for the total group is four years one month with a standard deviation of 11.4 months.

In the picture articulation test constructed for this study, the words illustrated were taken from the Thorndike, Stone, Gates and Wauwatosa Word Lists and from children's conversations. The test consist of 73 words, each illustrated by a picture, and measures 113 sound elements in the initial, medial and final positions. The test measures 25 consonants in all positions used in English, 28 consonant blends in the initial position, and eleven vowels and five diphthongs in the medial position. The initial and final [ð] are measured in words elicited through questions. '*Th*ere' is obtained in answer to the question, 'Where is the door?' 'Smoo*th*' is obtained in response to a question asking how a

1. *p*ipe, [p-] [-p]
2. *a*pple, [-p-]
3. *b*oy, [b-] [ɔɪ]
4. ba*b*y, [ei] [-b-]
5. bathtu*b*, [-b]
6. mou*th*, [m-] [-θ]
7. ha*m*mer, [-m-]
8. dru*m*, [ʌ] [-m]
9. te*l*ephone, [t-] [-f-]
10. mi*tt*ens, [-t-]
11. *f*eet, [i] [-t]
12. dog*h*ouse, [d-] [-h-]
13. ra*d*io, [r-] [-d-]
14. bi*rd*, [ɜ] [-d]
15. k*n*ife, [n-] [-f]
16. ba*n*ana, [-n-]
17. wago*n*, [-g-] [-n]
18. *wh*eel, [ʍ] [-l]
19. *k*ite, [k-] [αi]
20. *cr*acker, [kr-] [-k-]
21. *tr*uck, [tr-] [-k]
22. garage, [g-] [-ʒ]
23. *fr*og, [fr-] [-g]
24. *spr*ing, [spr-] [-ŋ]
25. *sw*inging, [sw-] [-ŋ-]
26. *h*ouse, [h-] [aʊ]
27. *sm*oke, [sm-]
28. *fl*ower, [fl-] [-w-]
29. *w*atch, [w-] [-tʃ]
30. black and *wh*ite, [-ʍ-]
31. *f*ea*th*er, [f-] [-ð-]
32. *v*alentine, [v-]
33. *dr*iving, [dr-] [-v-]
34. *st*ove, [st-] [-v]
35. *th*umb, [θ-]
36. too*th*bru*sh*, [-θ-] [-ʃ]
37. *th*ere, [ð-]
38. smoo*th*, [-ð]
39. *l*adder, [-l-] [-r]
40. *y*ellow, [j-] [-l-]
41. *c*arrots, [-r-]
42. *s*oldier, [s-] [-dʒ-]
43. *gl*asses, [gl-] [-s-]
44. *gr*ass, [gr-] [-s]
45. zipper, [z-]
46. *pr*esent, [pr-] [-z-]
47. *sh*oes, [ʃ-] [-z]
48. di*sh*es, [ɪ] [-ʃ-]
49. mea*s*ure, [-ʒ-]
50. *ch*air, [tʃ-]
51. ma*tch*es, [æ] [-tʃ-]
52. *j*ump, [dʒ-]
53. cage, [-dʒ]
54. oni*on*, [-j-]
55. *br*ead, [br-] [ɛ]
56. *bl*ocks, [bl-] [ɑ]
57. balls, [ɔ]
58. *sn*owman, [sn-] [o]
59. *sp*oon, [sp-] [u]
60. b*oo*k, [u]
61. m*u*sic, [ju]
62. *pl*ay, [pl-]
63. *cl*own, [kl-]
64. *qu*ack, [kw-]
65. *sh*redded wheat, [ʃr-]
66. *sk*ate, [sk-]
67. *sl*ed [sl-]
68. *tw*ins, [tw-]
69. *thr*owing, [θr-]
70. *scr*ubbing, [skr]
71. *squ*irrel, [skw-]
72. *spl*ash, [spl-]
73. *str*awberry, [str-]

glossy photograph feels. Following is the list of test words with the tested sound elements italicized.

Ten sounds were measured in two different words, both illustrated by pictures. The sound and the words in which they were tested are:

Sound	*Original Words*	*Supplementary Words*
[-ŋ]	spri*ng*	ri*ng*
[-t-]	mi*tt*en	si*tt*ing
[-t]	fee*t*	boa*t*
[k-]	*k*ite	*c*omb
[d-]	*d*oghouse	*d*oll
[v-]	*v*alentine	*v*acuum cleaner
[-z-]	pre*s*ent	sci*ss*ors
[-dʒ]	ca*g*e	ora*ng*e
[i]	fee*t*	te*e*ter-totter
[aɪ]	*k*ite	*b*icycle

The inclusion of the original and supplementary words on 159 tests makes possible the comparison of articulation of specific sounds in different words.

Three measures of the child's articulation were obtained at each test session. The first measure, designated as the Picture Test, is his articulation of specific sounds in words uttered spontaneously in response to the pictures. The second measure, Aural Test A, is his response when he has the word pattern of the examiner to imitate and the picture is still before him. The third measure, Aural Test B, made at the end of the test session is his repetition of each of the words after the examiner with the picture no longer before him. At the beginning of the test session the child was told, 'I'm going to show you some pictures, and I want you to tell me what they are pictures of. After you tell me the name of the picture, I'm going to say it again. Then you say it after me so I'm sure to hear it just right.' For Aural Test B the child was again asked to repeat the words so that the examiner would be certain she had heard exactly what he said. The children cooperated willingly.

Separate records were kept for the Picture Test, Aural Test A and Aural Test B. On the Picture Test sounds not spontaneously elicited were indicated and only correct and incorrect utterances were recorded. Incorrect utterances included indistinct, defective, substituted and omitted sounds. Refusals to respond were encountered on only three Aural Tests A and B and involved only twelve sounds.

To compare articulation measured in spontaneous and repeated words, the percentage of correct utterance is used as an articulation score. On Aural Tests A and B the articulation score is the percentage of 113 sound elements correctly produced. Refusals were omitted, and percentages computed only on sounds actually tested. On the Picture Test, the articulation score is the percentage of the total number of sounds tested which are correctly produced. The number of sound elements tested ranges from 31 to 112. The median number is 101.6; the mean is 95.3.

One examiner did all the testing. Her reliability as an observer was not determined. But Henderson (**2**) reports that 'correctness and incorrectness of consonants as articulated by subjects in person and in recorded speech possess a considerable degree of objectivity (1) when the judges have good hearing and (2) when the judges are practiced and expert in the detection of retarded speech sounds' (**2**). She reports from 77 per cent to 90 per cent agreement between any two judges on the correctness and incorrectness of sounds, but only 69 per cent and 85 per cent agreement as to the specific error. Similarly Irwin and Chen (**3**) report agreement above 90 per cent between two observers on vowel utterance of infants. Since the hearing of the experimenter is normal, since she has had considerable phonetic training, and is much practiced in the phonetic transcription of the speech of preschool children, and since this study is concerned only with the correctness and incorrectness of sounds, the reliability of the examiner has not been determined for this portion of the study.

TABLE 1. Mean total articulation scores on Picture, Aural A, and Aural B Tests.

	First, Second and Third Tests			*First Tests*		
	N	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
Picture Test	214	79.28	15.99	100	75.25	17.63
Aural Test A	214	79.42	17.16	100	74.85	19.06
Aural Test B	214	80.33	17.24	100	75.85	15.18

RESULTS

The mean articulation score for all tests and for first session tests separately are presented in Table 1. When the 214 first, second, and third session tests are considered, the mean percentages of correct utterance on the Picture, Aural A and Aural B Tests are all within one per cent of each other. No statistically significant differences are found between the total articulation scores by any of the test methods. More than half of these tests, however, are second and third session tests, and the effect of previous test experience is not known. Analysis of the 100 first session tests gives results similar to those found for the 214 tests. The mean percentages of correct utterance on the Picture, Aural A and Aural B tests are again within one per cent of each other. The differences between mean articulation scores for the three methods are not statistically significant. Previous experience with the picture articulation test would seem, therefore, to have no effect on the results obtained. Since the mean C.A. of the children at the first session test is lower than the mean C.A. at which the 214 tests were administered, the mean articulation scores are also lower.

Agreement is close between the mean articulation scores on the Picture, Aural A and Aural B Tests obtained at half yearly age intervals from two through six and a half years. The number of tests at each age level is small, but the similarity between the curves of total articulatory development is shown in Figure 1. (See page 297). In the appraisal of total articulation, spontaneous and imitated vocalizations, with or without the presence of pictures, give very similar results throughout the preschool years.

The close resemblance between the results obtained by the different test methods is confirmed in the correlations presented in Table 2. The intercorrelations of the Picture, Aural A and Aural B Tests are all above .95. When chronological age is correlated with articulation scores on the Picture, Aural A and Aural B Tests, correlations of similar magnitude are obtained.

To determine whether spontaneous and imitated words provide equivalent measures for specific speech sounds, the correct and incorrect production of each sound element was tabulated for the Picture, Aural A and Aural B Tests. Percentages of correct utterance for each sound on the Picture Test was computed as the percentage of the total number of measures produced correctly. Since 100 cases were measured on Aural Tests A and B, the results obtained were directly in terms of per cent. A critical ratio of 1.96 or above indicates significance at the 5% level of confidence; one of 2.58 or above at the 1% level. No significant differences are found on any of the 113 sound elements between Aural Test A and Aural Test B, i.e. between imitated responses with and without the presence of the stimulus picture. Significant differences were obtained between the Picture Test and Aural Test A and between the Picture Test and

TABLE 2—Intercorrelations of Picture, Aural A, Aural B Tests and chronological age.

	Picture Test	*Aural Test A*	*Aural Test B*
Aural Test A	.96		
Aural Test B	.95	.98	
C.A.	.63	.64	.64

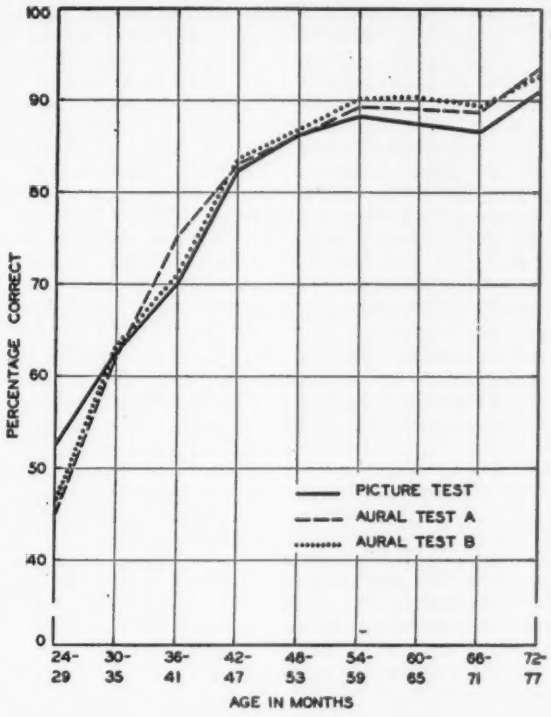

FIGURE 1. Comparison of scores on Picture Test, Aural Test A, and Aural Test B by age.

Aural Test B on 13 sounds. Among these [k-] [v-] [-ð] [-z-] [-j-] [tw-] [skr] and [str-] were measured on less than half of the Picture Tests; [kl-] was measured on 58 tests; and [f-] and [-h-] involved extreme percentages of correct utterance (99 per cent and 100 per cent). On the eleven sounds in which about half of the children were measured, the higher percentage of correct utterance is on the spontaneous verbalization. On only two sounds, [-t-] and [-ʒ], the higher percentage of correct utterance is on the imitated verbalization. This is not the expected finding. The methods providing a pattern to imitate would be expected to yield more correct utterances. The opposite finding is explained by the fact that on nine of the sounds a large proportion of the children were not tested on spontaneous verbalizations. Those children responding to the pictures have a larger vocabulary. Greater articulation skill is related to vocabulary skill at this age level. The rho between the spontaneous utterance of fifteen words and the correctness of the articulation of sounds tested in those words is .76. The sample for the Picture Test is selected in the direction of a larger vocabulary, whereas the entire group is included in the sample for Aural Tests A and B. The technique for significance of differences assumes a random sample of the population. To compare accurately the production of these sounds when measured in spontaneous and imitated words, the same tests should be in-

cluded in spontaneous and imitated verbalizations. When only tests in which the sound is measured spontaneously are included in Aural Tests A and B, significant differences are obtained only on [-t-] and [-ʒ]. The critical ratio for [-t-] between Picture and Aural A is 2.07, between Picture and Aural B it is 2.84. The critical ratios for [-ʒ] between the Picture and Aural A is 3.33, and between Picture and Aural B it is 3.85. For both of these sounds the imitated tests yield the higher correct articulation.

The [-t-] is measured in 'mitten' and [-ʒ] is measured in 'garage.' Both of these are poor choices as test words. In ordinary conversation the final [ʒ] in 'garage' is frequently pronounced [dʒ], and the medial *t* in 'mitten' is often voiced or elided with the following [n]. The children frequently changed the [dʒ] to [ʒ] or produced a clear [t] when the pattern was presented. These obtained differences are probably related to the pronounciation of the particular test word rather than to the articulation of the specific sounds tested. It is difficult to find satisfactory words in which to measure these sounds. In the supplementary word list [-dʒ] was not measured, but [-t-] was measured in 'sitting.' This, also, is an unsatisfactory word, since in ordinary conversation the [-t-] is frequently voiced. Obtained differences between spontaneous and imitated utterances of the [-t-] are also significant in this word. The critical ratio between Picture Test and Aural A is 5.45, and between Picture Test and Aural B is 9.45. Higher scores were made on the imitated tests. In the supplementary word list a significant difference was also found between repeated and spontaneous utterance on [-t].

An item analysis using the Lawshe nomograph (4) was made of each test method to determine the sound elements most discriminating between good and poor articulation. The discrimination value for each of the 113 sounds in the Picture, Aural A and Aural B Tests was calculated, using contrasting groups made up of the upper and lower 27 per cent on the summed articulation scores on the three tests combined as the criterion. Twenty-one sound elements received D-Values of 2.5 or higher by all three test methods; thirteen received D-Values of 2.5 by two test methods and 2.0 or above on the third; seven received D-Values between 2.0 and 2.5 by all three methods. All three test methods selected the same 41 sound elements as those most discriminating between good and poor articulation. On specific sounds essentially the same test result is obtained in a spontaneously or imitated word.

To determine the effect of different test words on articulation measured by the same method, the significance of the differences for each of the ten sounds between correct production in the original and supplementary test words was computed. On Aural Tests A and B, 159 tests are included. In the Picture Tests only those tests in which both original and supplementary words are spontaneously uttered are included. Table 3 presents those sounds which show significant differences between correct utterance on original and supplementary words by test methods. Only five of the 30 differences are significant: the [ŋ] on the Aural Test A and B; the [-t-] and [k-] on Aural Tests B, and [-dʒ] on the Picture Tests. The obtained difference on [-dʒ] between the Picture Tests can be explained in part by the picture selected to illustrate 'orange,' the supplimentary test word. Unfortunately both an orange and a glass of orange juice were included in the picture. Many children responded with 'orange

TABLE 3—Significant critical ratios between sounds in original and supplementary test words.

Sound	*N*	*Picture*	*Aural A N = 159*	*Aural B N = 159*
[-ŋ]	66	—	2.38*	2.15*
[-t-]	82	—	—	3.57
[k-]	86	—	—	2.14
[-dʒ]	109	3.21*	—	—

*Supplementary test words higher.

TABLE 4—Discrimination values in ten sounds tested in original and supplementary tests.

	Original Words				*Supplementary Words*			
Sound	*Picture*	*Aural A*	*Aural B*	*Mean D-Value*	*Picture*	*Aural A*	*Aural B*	*Mean D-Value*
[-ŋ]	1.5	1.4	1.5	1.5	1.4	0.9	0.6	1.0
[-t-]	−0.6	−0.1	−0.1	−0.3	0.2	0.3	0.0	0.2
[-t]	1.4	1.4	1.1	1.3	1.6	1.3	1.2	1.4
[k-]	2.0	1.3	1.7	1.7	1.6	1.6	1.5	1.6
[d-]	1.6	0.7	1.2	1.2	1.6	0.6	0.6	0.9
[v-]	1.9	2.3	2.7	2.3	1.9	2.5	2.8	2.4
[-z-]	1.5	1.7	1.6	1.6	2.4	2.4	2.4	2.4
[-dʒ]	1.5	1.5	1.5	1.5	3.4	3.0	3.1	3.2
[i]	1.5	0.0	0.0	0.5	2.4	0.6	0.0	1.0
[ai]	2.0	0.0	0.5	0.8	1.1	0.6	0.6	0.8

juice.' The observed differences on the [-t-] may be a function of a changing standard on the part of the investigator. In comparing correct production on the first, second and third session tests, a greater proportion of utterances were judged correct on the first session tests. This shift in standard is probably related to the poor test word. The higher percentages of correct utterance for [-ŋ] and [k-] are both above 95. The initial blend in 'spring,' the original word, is more difficult for the children than the initial sound in 'ring,' the supplementary word. This may influence the production of the final [ŋ].

An item analysis of the ten sounds, each of which occurred in two different words, was carried out using the method described above. The sum of the total articulation scores on the Picture, Aural A and B Tests on 123 items was taken as a criterion of good articulation. The D-Values are presented in Table 4. With the exception of [-z-] and [-dʒ] all mean D-Values on the same sounds are within 0.5 of each other. The deviation on [-dʒ] is explained on the basis of the choice of picture to illustrate 'orange.' The mean D-Value obtained for [-dʒ] on the supplementary word (3.2) is more similar to the mean D-Value of the medial [dʒ] (2.6) than to that of the final sound in the original word. The [-z-] in the supplementary list is measured in 'scissors,' a word on which children are likely to receive more specific practice than 'present.' The essential similarity of the D-Values for these sounds indicates that the specific word in which a sound is tested is not important.

CONCLUSIONS

1. In measuring the total articulation of preschool children, similar results are obtained if the sounds are measured in words spontaneously elicited or repeated after the examiner. The presence or absence of pictures in the imitative situation does not influence the results. No significant differences in the mean total articulation scores on the Picture, Aural A or Aural B Tests are obtained. No practice effect is evidenced from repeated experience with the test. The gains in articulation with age when measured by each of the three methods are similar; and the correlation coefficients with chronological age are similar. The intercorrelations between Picture, Aural A and Aural B Tests are all above .95.

2. In measuring the production of specific sounds similar results are obtained by spontaneous and imitative methods. The only significant differences between methods of testing occur on two sounds which were measured in poorly selected test words. Picture, Aural A and Aural B Tests select the same sounds as most discriminating between good and poor articulation.

3. Similar results for specific sounds are obtained when the same sound is presented in different words. Few sig-

nificant differences between spontaneous and imitative methods are found for sounds presented in different words. The mean D-Values for specific sounds are similar whether measured in original or supplementary words.

There is no difference in measured articulation when a sound is tested in a word spontaneously uttered or in a word repeated after the examiner. This holds both for total articulation scores and for specific sounds. Careful judgments of any utterances, whether spontaneous or imitated, are similar. There is little difference in measured articulation when the same sound is tested in different words. This holds for both spontaneous and imitated verbalizations. The measure of a specific sound is a measure of the general ability to produce that sound and not to articulate it in a specific word.

The similarity of the results obtained for different words and for different methods has important practical implication for testing articulation. Since neither the spontaneous nor imitative method is superior, the method best adapted to the needs of a specific child can be used. Pictures can be used as stimuli, as motivating devices, or not at all. The articulation of any child can be measured regardless of his vocabulary level. Since the imitative situation is most readily presented and measures articulation in a substantially shorter period of time, it can be used for testing large groups of children.

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The Efficacy of Speech Re-education of Functional Articulatory Defectives in the Elementary School

Gladys Reid*

IN THE LITERATURE of speech correction, there is very little objective evidence to substantiate claims that have been made for speech therapy. Considering the great amount of time and energy expended on speech defectiveness in speech clinics all over the country, it seemed to this observer that some research into the effectiveness of speech reeducation might be appropriate.

As the rehabilitation of speech is a large field and speech defects group themselves into several types, it seemed necessary to select for study one type of speech defect that would meet: (1) the experimental requirements of availability, isolation, and control and (2) the practical requirements of studying a type of defect that appears frequently, on which a large part of the speech therapists' time and energy is expended, and on which a large share of the school boards' budgets for special education is spent.

It appeared to the writer that those phonetic lapses that are found in the speech of elementary school children and that group themselves together under the common designation of functional articulatory defects would meet the two-fold criteria for study. In selecting functional articulatory defects, the writer excluded all those speech disorders involving obvious pathologies. The reason for excluding the speech pathologies is simply the fact that, where pathologies are concerned, experimental method is most difficult if not impossible. The essence of pathology is difference. No two spastics have central nervous systems that present identical lesions, no two palates are naturally cleft or surgically repaired in the same way. Because of this lack of homogeneity, adequate control cannot be obtained.

However, in spite of the fact that progress or improvement in the reeducation of these speech defectives cannot be demonstrated experimentally, the clinical treatment of these cases will continue in organized speech clinics. The reason for this is simply that those who serve in speech clinics have no doubt that these speech defectives do improve and progress toward normal speech, frequently achieving normal speech. It is also commonly held that the speech improvement made is directly due to speech reeducation.

Also, it should be noted that although there is no doubt as to the effectiveness of speech reeducation insofar as the speech pathologies are concerned, there has arisen doubt as to whether the improvement made by functional articulatory defectives is due to maturation, or speech re-education, or both.

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Functional Articulatory Defects Defined

Hansen (**9**, 347) states that functional articulatory defects 'include lisping, sound substitutions, sound omissions, infantile speech, slurring and other defects of distinctness of a functional nature.'

Van Riper (**18**, 672) defines baby talk as 'those cases in which no organic defect is a causal factor and in which there is no other evidence of mental or physiological retardation. In other words, "baby talk" is the articulatory disorder due to delayed or interrupted speech maturation. There is no pathology. The child's organs used in speech are normal, and other children of the same age speak without the omissions, distortions, and sound substitutions that make speech peculiar and unintelligible.'

For the purposes of this study, we consider a functional articulatory defect as any phonetic lapse, substitution, omission, or distortion of sound, for which there is no apparent cause.

The Incidence and Distribution of Functional Articulatory Defects

It is the common opinion of speech correctionists who have worked with children in the elementary schools that functional articulatory defects are the most prevalent type of speech defect and therefore occupy the largest part of the speech teacher's case load. This opinion has been substantiated by several surveys.

The White House Conference on Child Health and Protection of 1930 (**20**) reported studies of speech defectives found in 48 American cities. The questionnaire survey showed 5,770.24 cases of sound substitution and oral inactivity out of every 10,000 cases of defective speech. The city of Madison survey showed 5,865 cases of sound substitution and oral inactivity in every 10,000 cases of defective speech.

Table 1, taken from the White House report (**20**, 358, 359), is of most bearing on the present study.

TABLE 1. Rapid decrease, shown grade by grade, in the number of cases of sound substitution as a result of speech correction work. (**20**, 358, 359).

Grade	*Boys*	*Girls*
1	3854	2533
2	2684	1725
3	1916	1042
4	1223	738
5	848	538
6	657	402
7	277	175
8	190	108
9 & 10	82	71
11 & 12	28	25

In reading the White House Conference report, caution must be taken in interpreting the tables; e. g., the caption on Table 1, quoted from that report was supplied by the editor, and the inference the editor makes is not born out in the body of the report which claims only that speech correction may be one possible cause of the rapid decrease, grade by grade, in the number of cases of sound substitution.

In 1925, Root (**14**, 533-535) made a study of the speech defectives in the public elementary schools of South Dakota. This study considered the grades individually, beginning with the first grade. Concerning speech disorders generally, Root says:

> The relative extent of speech disorders does not remain uniform throughout the eight grades. There is, however, an almost steady decrease in the extent of speech defects up to the third grade. Between the third and the fourth grade there is a sudden rise; there is then a gradual decrease to the eighth grade. The percentage of stuttering and stammering apparently increased considerably in Grade IV, continuing to Grade V, and then very gradually decreasing to Grade VIII. It is this sudden increase in stuttering that makes the total percentage of speech defects high in Grade IV. . . The curve for lallers and lispers shows an almost 60 per cent decrease in the extent of this disorder between Grades III and IV; between Grades I and IV, there is a decrease of approximately 80 per cent. It was found, contrary to popular belief, that by far the greatest percentage of speech defectives were lispers or lallers, this class comprising 2.6 per cent of the entire school population or 41.2 per cent of all speech defectives.

In 1930, Francis (**8**, 15) made a survey of the speech defectives of

Iowa City, Iowa. Of 3,175 children in the Iowa City Schools, 366 of 11.52 per cent were found with speech defects. 51.8 per cent of the total number of speech defectives were functional articulatory cases. The grade distribution of these cases is shown in Table 2. Here again we see a striking decrease in incidence of speech defects with increase in age, especially in the first four school years.

TABLE 2. Grade distribution of 191 cases of functional oral inaccuracy (8).

Grade	*Percentage*
Kdg.	27.8
1	19.3
2	11.5
3	9.9
4	3.1
5	3.6
6	2.1
7	2.6
8	4.7
9	2.6
10	6.7
11	2.1
12	4.7
TOTAL NUMBER	191.0

In a survey made by Wight (**20**, 354) in Ypsilanti, Michigan in September, 1944, 123 children were found to have speech defects out of a total population of 1,385 elementary school children. Table 3 shows the number of functional articulatory cases in Grades I through VI.* Here also a very large proportion of the total cases are functional articulatory ones and a rapid decrease from grade to grade is obvious. What makes the Wight survey of special interest to us is the fact that it was made in a city that had had no speech correction program previous to September, 1944.

From this discussion, we may safely conclude that functional articulatory defects comprise at least 50 per cent of the total cases of defective speech in the elementary school population. We may also conclude that this type of speech defect shows a very rapid decrease in incidence with increase in grade level both in school systems having speech correction and in those not having speech correction. The last conclusion suggests an interesting problem and serves as the direct motivation of this research.

*Statistics provided by Maralyn Wight, Ypsilanti, Mich. (1945).

TABLE 3. The number of functional articulatory defectives in Grades I through VI in the public elementary schools of Ypsilanti, Michigan.

Grade	*Number*
1	41
2	25
3	14
4	12
5	5
6	0
TOTAL	97

STATEMENT OF PURPOSE

In view of the fact that the high incidence of functional articulatory defects in school children involves a great expenditure of the speech teacher's time and energy, and also the fact that functional articulatory defects decrease directly with maturation, the question naturally arises as to whether the speech teacher might not better spend her time with other types of speech disorders that do not decrease in incidence so markedly in relation to maturation.

One way of finding the answer to this question is quite clearly provided by experimental method. The effect of reeducation of functional articulatory cases readily lends itself to investigation by this method, since the misarticulations involved are easily measured and controlled.

The purpose of this research, therefore, is primarily to study the effect of speech training and of maturation, respectively, upon functional articulatory defects of children in the elementary grades.

A secondary purpose, developing out of the data collected from the subjects selected for the experiment, is to study the presence of other measurable developmental factors in relationship to the presence of functional articulatory defects and to the effectiveness[1] of speech reeducation. This

[1] By effectiveness of speech reeducation is meant the amount of improvement a child makes in correcting his defective sounds.

aspect of the study will be discussed in a later article.

In consideration of the first problem, the questions that arise are:

1. What is the effect of speech reeducation upon functional articulatory defects in the elementary grades?

2. What is the rank order of the effectiveness of speech reeducation in the several grades? Do children with the most defects make the most improvement?

3. Does the rank order within the group receiving speech therapy change or remain the same as it originally was?

4. What is the effect of maturation upon functional articulatory defects in the elementary grades?

5. What is the rank order of the effectiveness of maturation in the several grades? Do children with the most defects make the most improvement?

6. Does the rank order within the group not receiving speech reeducation change or remain the same as it originally was?

Pertinent Previous Investigations

Irene Poole's (**11**, 59) study of the genetic development of consonant sounds in children's speech indicated:

> Articulation ability is directly related to chronological age of normal children, and to mental age. Articulation efficiency increases with both chronological age and mental age from 30 months until 102 months. Within 12-month age groups, however, there is little relation between articulating and mental age. . . . .
>
> Boys and girls develop articulation efficiency at about the same rate from 2.5 to 5.5 years of chronological age. From this point, the girls in the study show more rapid growth, approaching articulation efficiency, as indicated by zero scores on the test, at about 6.5 years, while boys require another year until 7.5 years of chronological age to reach the same degree of perfection.

In 1929, Dawson (**7**) published the results of an investigation of the vocal articulation of pupils of various school ages to determine whether the rate of articulation develops after children enter school, and to study the nature of the development. The investigation showed that 'pupils developed in ability to articulate sounds after they entered school. The development was greatest during the first three years. . . . Three factors found to bear a close relation to the rate of articulation were age, sex and intelligence' (**7**, 614, 615). The author concluded that the development of skill in articulation follows the general rule of motor learning. The rate of learning is rapid in the beginning but is retarded as the individual reaches a state of satisfaction or becomes interested in other things. 'Articulation,' states Dawson, 'is motor ability, and it is only reasonable to assume that factors which affect other motor abilities also affect the rate of articulation.' The correlation between the rate of tapping and the rate of articulation was .732±.012.

In 1929, Berry and Stoddard (**3**) made a study to determine to what extent lispers who receive no corrective speech training improve, as compared with those who receive such training. Two hundred and twenty-four pairs of lispers were selected from the Detroit Public Schools. They were matched as to school, grade, extent of defect, intelligence quotient, chronological age and language spoken at home. Twenty-eight teachers in the Detroit schools each selected and tested 16 lispers. After these lispers were paired, half of them were given speech training by these same teachers in their own speech improvement classes. At the end of a six-month period, the same teachers retested their own experimental and control groups. The controls had received no speech training. The experimental subjects had received two 35-minute lessons a week in regular speech improvement classes.

On the second speech test, the experimental group averaged 27.5 fewer errors than on the first test; the control group averaged 4.3 fewer errors on the second test than on the first test. Only 1.7 per cent of the experimental group failed to gain, whereas 45.3 per cent of the control group made no gain.

In 1932 Ness (**10**) did a study in which she compared the 'response' and 'stimulation' methods in the reeducation of speech defectives. The results obtained are of interest in con-

nection with the present research in that the two methods employed differ as to the quantity and quality of speech therapy. In the 'response' method, the teacher says the correct sound one time and the pupil repeats it five times. In the 'stimulation' method, the teacher says the sound five times and the pupil repeats it once.

Thirty pairs of articulatory defectives were selected and matched for intelligence quotients, chronological ages and sex. The two groups were tested before and after a period of training. The group trained by the 'stimulation' method made consistently better results on the second test than the group trained by the 'response' method.

Sommer (**16**) attempted to determine to what extent preschool children with articulatory defects who are given corrective speech training improve as compared to similar preschool children who are given no training. The subjects were 34 nursery school children from 26 to 59 months of age. These children were tested and from them two groups (experimental and control) were selected. The two groups consisted of 11 pairs of nursery school children and three pairs of kindergarten children; there were also three pairs of kindergarten children who received only six weeks of training. The pairing was done on the basis of speech defects. The experimental group was given speech correction for 15 minutes per day. There were two testers and the children were given pre- and post-tests.

The conclusions to Sommer's study are interesting but perhaps should be evaluated with reference to the number of cases used. Sommer concluded that 'the preschool children showed improvement in articulation regardless of whether they had been trained systematically. The improvement made by the experimental group, however, was significantly greater than that made by the control group.'

In 1939, Backus (**2**, 29) reported the results of a speech correction program carried out in an elementary school system during a two-year period. The case load consisted of 592 pupils with the children from the kindergarten being selected for the primary area of concentration for speech correction. In this program, each child was given individual instruction three times a week. When the children learned to speak correctly, training was discontinued. Gradually individual instruction was extended to first grade pupils. By the end of the first year, special training was being given to all in the elementary schools. 'The periods of instruction varied—although many of the children were taught to speak normally in two weeks.'

At the end of two years, 336 of the original 592 cases had been entirely corrected. Backus attributes the correction to speech therapy. As there was no control group utilized, there is no way of knowing to what extent the maturation that took place in the two-year interval may have contributed to the speech improvement of the 336 cases.

Table 4, compiled from Backus' statistics, shows the original number of functional articulatory defects in Backus' group at the beginning of the two-year period, and the number of these cases corrected at the end of the two years.

Davis (**6**) compared the speech of pupils on the third grade level in a school with a program of speech correction with the speech of those in a comparable school without a program of speech correction. She found a

TABLE 4. Number of cases given speech therapy and number of cases corrected in an elementary school during a two-year period (**4**).

Classification	*Original Number*	*Number Corrected*
Lisp	218	117
Lateral Lisp	27	6
Sound Substitution	261	143
Indistinct Speech	69	66
TOTALS	575	332

tendency in the direction of fewer speech defects and defectives in the school with the program of speech correction.

To date, probably the investigation concerning this problem that was most carefully controlled experimentally and most carefully analyzed statistically was made by Reynolds (**12**, 39-40). Reynolds came to the following rather startling conclusions:

1. In a period of seven months among kindergarten children with functional articulatory defects, the improvement of the children who had received special speech training was not statistically different from the improvement of the children who had not received that training.

2. The described system of correcting articulatory defects among kindergarten children is worthless.

Roe and Milisen (**13**) studied the effect of maturation upon functional defective articulation in the elementary grades by testing and analyzing the misarticulations of a large group of Indiana school children, grades one through six, who had never had speech training. A definite decrease was found for the mean number of errors from the first through the fifth grades. The decrease as a result of maturation was less in the higher grades than in grades one, two and three. The effect of maturation on the number of errors varied from one sound to another. The same number of children made errors on [M] in the fifth and sixth grades as in the first.

Thus we have to date what appears to be a rather contradictory assemblage of data concerning the problems of the effectiveness of speech correction at different school levels and of the role maturation plays in learning speech after the child enters school.

Pertinent Current Opinion

Sommer (**16**, 91) says:

Wile, Brigance, Martin and Case all state that corrective training should be instituted in the plastic years of early childhood, and place the emphasis on the early school grades as the most practicable time and place for speech instruction. The statements of Gesell, Stinchfield and the Blantons, however, indicate that these authors consider the preschool years as the most fruitful training period. Logical and reasonable as these opinions are, they as yet lack the support of experimental studies.

Poole (**11**, 54) says:

Since the tendency is for ability in articulation to progress regularly toward perfection at six years, it is a question whether special training toward speech improvement or the correction of articulation defects should be attempted before this age. A child who, by eight years, still shows wide deviations from the usual distribution of scores may be looked upon as a clinical case, or at least a case for whom some direct help in articulation is provided. The presence or absence of other factors or attitudes or behavior, etc., operate to change decisions based on these conclusions.

Bryngelson (**5**, 880) says in direct opposition to Poole:

The prevalent belief that a child is expected to go through a period of poor speech during a certain period of development has misled parents into a policy of hoping and waiting for the termination of this disturbing period of poor speech. If a child has not established an intelligible speech pattern by the age of four, it is time to consider the matter seriously and to have a thorough examination of the child in some reputable clinic. . . . It is true that many of the milder types of speech disorders tend to subside during the elementary school life of a child. When this occurs, it is ascribed to the fact that through maturation or growth processes, the brain has been able to establish a well defined speech pattern.

Brown (**4**, 197) in discussing 'baby talkers' says that children with defective articulation enter kindergarten and first grade and may improve after a year or two 'but at a cost of retardation in the child's learning which is impossible to estimate.' He maintains that most 'baby talkers' have difficulty in learning to read and write and that they are handicapped in understanding and remembering what they read. Brown also thinks that these children have difficulty in making the necessary social adjustments to authority and to the routine of the classroom.

Arey (**1**, 265) is in agreement with the idea that speech correction is most helpful when begun early so that 'the

procedures may be largely those which will inhibit the formation of inadequate or incorrect speech patterns simply by establishing desirable speech habits.'

A report on the speech correction classes of Denver (**17**) maintains that the kindergarten and primary grades are the best periods in a child's life for speech correction work.

Van Riper (**19**) recommends that the speech correctionist should confine her efforts to the grades above kindergarten, since many children in the preschool have not matured sufficiently to acquire certain of the speech sounds.

Procedure

As the results of Reynolds' (**12**) study appear conclusive for children with functional articulatory defects at the kindergarten level; and as this study is concerned with similar problems but at the elementary school level, the writer decided to follow Reynolds' procedure rather closely insofar as it was possible and expedient.

Subjects

An experimental group of 38 children in grades one through seven was selected from elementary schools in and near Madison, Wisconsin. In these schools there was no program of speech correction. The bases for selection of these children were:

1. The presence of articulatory defects.
2. The absence of any organic anomaly that might contribute to the speech defect (each child was given 2A audiometric examination).
3. At least low normal intelligence (I.Q. not lower than 75).
4. The absence of any other apparent etiological factor.

A control group of 41 children was selected from grade one through eight. The bases for selection were the same as those listed above. This group was selected from schools different from those of experimental group. There was no speech correction program in the schools attended by the controls.

Measurements

The only measurements of significance for the purposes of this paper are:

a. Chronological age.
b. Intelligence quotient.[2]
c. Sex.
d. Grade.
e. Articulation scores.

The Testing Situation

All children were given a speech articulation test at the beginning of the experiment and at the end. An interval of about six months, from October to May, lapsed between the two tests.

The test with one exception is the same as the one used by Reynolds (**12**) in her study. The children were asked to read, or, if they were unable to read, to repeat after the examiner a list of words designed to test the 23 English consonant sounds in the positions in which they occur. It was found necessary to add one word to the test used by Reynolds; *the* was used in testing for [ð] in the initial position. Each child was tested individually.

At the beginning of the experiment the experimental and the control group were tested by one examiner, the writer. At the end, however, it was decided that a second examiner would provide for a measurement of the reliability of the test, although this had been established by Reynolds.[3]

In order to keep the testing as uniform as possible, each child read or repeated the words only once while both examiners simultaneously judged his articulation. No comparisons were

[2] In instances where there were no intelligence quotients the California Test of Mental Maturity was given by the writer. 'California Short-form Test of Mental Maturity,' California Test Bureau, Los Angeles, California, 1942.)

[3] Miss Quintilla Anders, a graduate student in the Department of Speech at the University of Wisconsin, volunteered to give the additional examination.

made by the two examiners until the final statistical analysis.

The method of scoring the speech test was devised by Josephine Simonson (**15**, 13, 14) and is identical with that used by Reynolds. Simonson says:

> It was necessary to determine a method of scoring the speech tests which would yield a weighted score. The system devised is based on the order of development as found on page 180 of West, Kennedy and Carr's *Rehabilitation of Speech.* It appears logical to the writer that if the child has a defect of one of the earlier appearing sounds such as [p], [b], or [m], his speech maturity would be penalized more than if he has a defect of the later appearing sounds as [s] or [r]. So each sound was given an arbitrary number from 1 to 23, depending on its order of development. The sum of these rank numbers, multiplied by the number of positions tested yielded a maximum score of 828. Thus, a score of 0 would indicate complete failure of articulatory development and a score of 828 would indicate no failure of articulatory development. It is to be noted that where an element is tested in only two positions, its full value is equal to its rank number multiplied by three. The reason for this can best be given in illustration. Let us take the sound [ʒ]: If [ʒ] whose rank number is 13 were multiplied by 2, which comprises the number of positions in which it is tested, it would yield a subtractive value of 26, which would be almost comparable to the subtractive value of [ð] which is much later in the schedule of development and therefore much further down the scale. One other point in the scoring that the writer wishes to make clear is that if a sound which is tested in 2 positions in a word is defective in only one position, its rank order is subtracted from the maximum score of 828, rather than half its full subtractive value. This point can best be explained by an example. If [ʒ] is defective only in the medial position, 8 is subtracted from 828, rather than 12 which would be equal to the full subtractive value of [s] which is four levels below [ʒ].

In scoring the articulation tests, it was decided to omit all errors made by substituting [ʍ] for [**M**] or [**hw**]. Hence, the children were given full credit for [ʍ] when it was substituted for [**hw**].

The Speech Reeducation Program

The children in the experimental group were given speech training twice a week for periods of 30 to 40 minutes. The children were grouped according to grade status, and usually there were from four to six children in a group. As the speech defects were corrected, the number of children in each group decreased so that toward the end of the experiment some children were receiving individual instruction.

The lessons were directed toward teaching the children to make their defective sounds correctly. When they had learned the correct sounds they practiced using them in drill and game situations.

In teaching the correct sounds all avenues of sensory approach were used. The children worked before mirrors in which they could see their own faces and that of the teacher. They were encouraged to utilize tactile and proprioceptive sensation in learning to distinguish between the 'feel' of the sounds when made correctly and when made incorrectly. Much drill in auditory sound discrimination was presented in game form. Any method that worked was utilized in making the speech training periods as successful and enjoyable as possible.

An attempt was made to have the children practice at home with drill material but this was not successful and so was discontinued.

The classroom teachers were advised when the children had learned the correct sounds sufficiently well to be expected to carry them over into oral classroom situations. Here the cooperation was fairly good although frequently the teachers were too fully occupied with their classroom programs to be of assistance.

The children in the control group received no speech training.

Statistical Analysis

The first problem of a statistical nature to be considered in this study concerns the extent to which the experimental and control groups were matched. The writer attempted to match the groups as to intelligence quotient, chronological age, grade and sex.

TABLE 5. Means and sigmas of intelligence quotients and chronological ages of control and experimental groups.

Intelligence Quotient	*Mean*	*Sigma*	*Sigma of Mean*	*N*
Control, male	108.7	13.6	2.5	27
Experimental, male	106.0	11.2	2.2	26
Control, female	102.7	9.2	2.5	14
Experimental, female	108.7	17.7	5.0	12
Total Control	104.4	12.2	1.9	41
Total Experimental	106.8	13.6	2.1	38

Chronological Age	*Mean*	*Sigma*	*Sigma of Mean*	*N*
Control, male	108.8	22.7	4.3	27
Experimental, male	107.8	22.4	4.4	26
Control, female	96.9	24.6	6.5	14
Experimental, female	97.0	18.4	5.3	12
Total Control	104.2	22.5	3.5	41
Total Experimental	104.3	21.3	3.0	38

These four factors were selected out of a number of possibilities for the following reasons: There is a high positive relationship between intelligence and ability to learn or benefit by instruction. As speech is a learned process there is a relationship between chronological age or time spent in an environment conducive to acquiring speech and the acquisition of speech. The children were matched roughly for grade to try to eliminate any possible influence general education may have on articulation.

The groups were matched roughly for sex in an attempt to negate any possible advantage in learning to articulate correctly that might be due to certain well-established sex factors. It is generally accepted that females begin to speak at an earlier age than males, progress more rapidly in acquiring speech, and undergo far fewer 'breakdowns' in the speech process.

Table 5 should be interpreted as follows: The means of the control and experimental groups are given in column one. It will be noted that the groups are broken down into male and female subgroups, and that finally the means for the control and experimental groups are totalled. The second column contains the standard deviations, indicating the variability within the groups. The third column shows the sigmas of the means and the fourth column the numbers of subjects. Table 5 contains data relative to both intelligence quotients and chronological ages of the experimental and control groups.

It will be noted that all the means, sigmas, and sigmas of the means are quite similar for the comparable groups, with the exception of the intelligence quotients of the control and experimental females. Here the mean of the control females is 102.7, sigma 9.2, sigma of the mean 2.45, whereas the mean intelligence quotient of the experimentals is 108.7, sigma 17.7, sigma of the mean 5.0. However, when the groups are totaled this difference is not in evidence and we may conclude that the two groups are rather well matched as to intelligence quotient and chronological age.

Table 6 shows the distribution of the experimental and control groups as to grade and sex. Here it will be noted that the subjects group themselves largely in the lower grades. This is the typical distribution for functional articulatory defects. The subjects were obtained from parochial and suburban schools in which there had not been any speech correction. The subjects in the control group were from three parochial and two public schools near Madison, Wisconsin. The subjects in the experimental group were from one parochial and two suburban schools.

The speech articulation test used in

TABLE 6. Distribution of subjects in experimental and control groups in relation to grade and sex.

Grade	*Experimentals*			*Controls*		
	Male	*Female*	*Total*	*Male*	*Female*	*Total*
I	7	6	13	7	8	16
II	4	4	8	6	3	9
III	6	0	6	5	1	6
IV	3	0	3	4	1	5
V	2	2	4	2	0	2
VI	3	0	3	2	0	2
VII	1	0	1	1	0	1
VIII	0	0	0	0	1	1
Total	26	12	38	27	14	41

TABLE 7. Analysis of covariance of the initial scores of the control and experimental groups, with the improvement made by the two groups.

Variation	*df*	Σx^2	Σxy	Σy^2	*df*	*S.S.*	*M.S.*	*F.*
Total	78	638603	-385184	343486	77	111156[1]		
Between	1	6432	-17905	49839				
Within	77	638603	-367279	293647	76	82414[1]	1084	
To test significance of adjusted means					1	28742[2]	28742	26.5[3]

[1] $S.S. = \Sigma y^2 - \frac{(\Sigma xy)^2}{\Sigma x^2}$

[2] 28742 = 111156 − 82414

[3] In the appropriate degrees of freedom the value of F with .001 per cent probability is approximately 11.9.

this study is considered both valid and reliable. Actually we have no statistical measurement for the validity of the articulation test as there are no external criteria available for such a measurement. A judgment as to correctness of articulation is at best arbitrary, depending on standards established socially and learned thoroughly by the examiners. The test consists simply of tabulating gross deviations from the speech sound norms that occur in a situation where children are required to articulate each sound in the positions in which it occurs in words.

The simplest way to check the reliability of the test was to have two examiners test each subject. It was impossible to do this for the initial testing; only the writer gave the initial diagnostic tests. However, two examiners administered the final tests to each subject in both the control and experimental groups.

The coefficient of correlation between the speech scores of the writer and the second examiner for 77 subjects in the experimental and control groups is .98 ±.003. This coefficient is high and significant. It corresponds with and confirms the result Reynolds (**12**) obtained in her study. We may, therefore, conclude that the method of testing articulation was quite reliable.

In order to determine whether or not the experimental group, which was subjected to speech re-education, advanced significantly further in learning to articulate correctly than did the control group, an analysis of covariance of the initial and final speech scores of both groups was made. (See table 7).

This method was selected because the two groups were not equated as to original articulation status. The mean of the initial speech scores of the experimental group was considerably lower than the mean of the initial scores of the control group. Hence, it was necessary to hold constant the initial comparative status of the groups.

Table 8 presents the initial and final mean speech scores and sigmas of the two groups, divided according to sex and then totaled. It will be noted that the mean initial speech score of the

TABLE 8. Initial and final mean scores (divided according to sex and then totaled) of experimental and control groups.

Initial Speech Scores	*Mean*	*Sigma*	*Sigma of Mean*	*N*
Control, male	751.5	69.43	13.3	27
Experimental, male	739.0	78.6	15.4	26
Control, female	725.3	103.3	27.6	14
Experimental, female	693.0	99.9	25.9	12
Total Control	742.5	82.5	12.8	41
Total Experimental	724.5	85.2	12.2	38

Final Speech Scores	*Mean*	*Sigma*	*Sigma of Mean*	*N*
Control, male	771.8	61.2	11.7	27
Experimental, male	814.6	23.3	4.5	26
Control, female	777.8	47.5	12.7	14
Experimental, female	787.0	61.2	17.6	12
Total Control	774.8	56.9	8.8	41
Total Experimental	801.5	36.08	5.8	38

control group was 742.5, while that of the experimental group was 724.5, which is somewhat lower. However, the final mean speech score of the contral group is 774.8, while that of the experimental group is 801.5. The control group did make some improvement during the time of the experiment. The experimental subjects, however, not only started below controls but at the end of the experiment were well beyond them.

When, in the analysis of covariance of the initial scores and improvement, the initial scores are held constant, the F value equals 26.5. For the appropriate degrees of freedom the value of F with .001 per cent probability is approximately 11.9. We may conclude, therefore, that the difference in means between the experimental and control groups is very probably not due to chance.

Correlations were run between the initial and final speech scores of the control and experimental groups. The coefficients are .764 ±.045 for the initial and final scores of the experimental group; and .630 ±.065 for the initial and final scores of the control group. These coefficients are highly significant and seem to indicate that both the experimental and control subjects maintain their positions within their groups in spite of the fact that, due to the nature of speech and the structure of the speech test, a maximum in articulation achievement exists which prevents those who reach perfection from going any further.

On examining the data it will be noted that although the mean speech score of the experimental group initially was 724.5, it rose to 801.5 on the final test, which is not far from the perfect score of 828. The mean initial score of the control group was 742.5 and it arose to 774.8 on the final testing.

Fourteen out of 38 subjects in the experimental group made perfect scores on the final test and 18 of the remaining 24 made final scores that were over 800. In the control group only one subject out of 41 made a final score of 828, and 16 out of the remaining 40 made final scores that were over 800.

The numbers of subjects in the experimental and control groups, are not large enough to make possible a significant further subdivision of speech scores according to grades. However, it is interesting to note the tendencies suggested in Table 9. In the experimental group the initial mean scores tend to increase through the fifth grade and then to decrease in the sixth grade. This appears also in the control group where the initial mean scores increase through the fifth grade. The final scores do not show such a positive trend, although the lowest mean scores are still in grade one.

The greatest difference between initial and final mean scores for the experimental group is to be found in the first and second grades. In the control group it is in first grade. It should also be noted that the tendency is for all subjects in the experimental group to gain considerably in score regardless of grade level. This would suggest that the point in age beneath which children may not be expected

TABLE 9. Means and sigmas of initial and final speech scores of experimental and control groups, subdivided according to grade.

Initial Scores

	Experimental Group			*Control Group*		
Grade	*No.*	*Mean*	*Sigma*	*No.*	*Mean*	*Sigma*
I	14	690.6	95.4	15	712.9	116.2
II	8	697	111.6	9	758.1	65.9
III	6	751	63.2	6	754.0	76.9
IV	3	776.3	28.7	4	756.2	52.9
V	4	783.2	36.2	3	789	22.1
VI and up	3	773	24.0	4	753.2	13.0
Total	38	724.5	85.2	41	742.5	82.5

Final Scores

	Experimental Group			*Control Group*		
Grade	*No.*	*Mean*	*Sigma*	*No.*	*Mean*	*Sigma*
I	14	792.3	46.6	15	784.2	65.2
II	8	800.0	59.7	9	777.4	51.2
III	6	819.0	7.8	6	773.1	65.6
IV	3	825.3	3.7	4	767.2	43.4
V	4	818.5	6.0	3	814.3	27.3
VI and up	4	823.6	6.1	4	779.7	21.7
Total	38	801.5	36.08	41	774.8	56.9

to benefit from special speech training is below the elementary school level.

Summary and Conclusions

The purpose of this research was to study the effect of speech re-education and maturation, respectively, upon functional articulatory defects of children in the elementary grades. To accomplish this an experimental group and a control group of children with functional articulatory defects were selected from the elementary grades. Two articulation scores were obtained for each child in the two groups, one at the beginning and the other at the end of a five-month period. The experimental group was given speech training by the writer. The control group received no speech training.

From this experiment it may be concluded that:

1. In a period of five months the improvement of the children who had received special speech training was different from the improvement of the children who had not received that training, and the difference was decidely in favor of the children who had received training.

2. Although there was not a sufficient number of children obtainable from each grade to break the group into sub-groups for fine statistical analysis, there was a tendency for all the children, no matter what the grade level, who had received special speech training to improve considerably more than the children who had not received special speech training.

3. Those children who did not receive special speech training tended to maintain the same relative status within their group in May that they had in October, with only one child attaining a perfect speech score in May.

4. Irrespective of original scores, a large number of children who had received special speech training made perfect or close to perfect speech scores in May, although there was a definite tendency for the children to maintain their original relative status within the group.

5. Those children who did not receive special speech training made some slight improvement in articulation ability in the five-month period.

From these findings, it is possible to infer that:

1. The described system of correcting articulatory defects in the elementary school is effective at grade levels one through eight.

2. Although maturation plays a part in a child's learning to speak correctly after he enters school, it is at best a very slow process as compared with speech improvement effected by special speech training.

That these speech defective children do eventually establish correct articulatory habits without a formalized program of speech reeducation is demonstrated by the decrease in their number from grade to grade. However, it seems apparent that a program of formal speech reeducation for functional articulatory defectives is desirable for the following reasons:

1. Some children do not attain perfect articulation during their elementary school career without special training. The ones who will cannot be predicted with our present knowledge and methods.

2. It has not been demonstrated, insofar as group statistics are concerned, that functional articulatory defects, per se, are responsible for social maladjustment. However, speech reeducation may eliminate the possibility of the development of inadequacies which are frequently observable in individual cases in clinical practice.

3. Children with these defects are inefficient in intellectual self-expression until they learn to speak correctly.

4. Speech reeducation, as demonstrated in this study, is a rapid and effective method of teaching correct speech patterns to children above the kindergarten level.

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'Client-Centered' Therapy for Voice and Personality Cases

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IT IS NOT UNUSUAL in clinical practice for a patient to come for aid with the complaint that he has great feelings of insecurity in speaking, either to groups of people or simply to individuals in a rather informal situation, or that his voice quavers when he talks, regardless of the circumstances, or that he feels panic-stricken when called on to recite in class, or that his voice is entirely inadequate in a number of situations, and he describes it as hoarse, husky, shrill, or weak, as the case may be. When an examination by a qualified otolaryngologist is made, and the report consists of only negative findings, we are not surprised, for from the statements of the patient we have gained the feeling that his problem is probably of psychogenic origin. Something has happened to this person, we decide, that has instilled an insecurity, a lack of confidence, possibly an hysterical reaction related to speaking to people, and we mentally conjure up a number of probable causes of his condition.

A discussion of the etiology of voice disorders occupies considerable space in speech pathology texts. Detailed descriptions with accompanying illustrations of organic abnormalities in the larynx, oral cavity, or nasal passages aid the clinician in an understanding of many voice deviations. Invariably, however, speech texts are noticeably deficient in descriptive or even case history material related to the so-called functional voice disorders. Speech clinicians often admit privately that they are at a loss to know what to do when a voice case with no pathology presents himself for treatment.

Some clinicians say at the outset that such cases should be referred to a psychologist; others attempt to employ their customary series of exercises for relaxation, voice control, resonance, etc. In some cases, such patients are told that they need to enter a speech class and gain confidence through repeated trials in a group situation. Psychotherapy, to such clinicians, seems to be a sacrosanct prerogative of the professional psychologist. And yet forms of psychotherapy are commonly employed by all clinicians in their work with other types of cases. It is important that speech clinicians become aware of the psychotherapeutic implications of the techniques which they are using and that they should learn to discriminate closely between cases for whom their techniques are adequate and cases whose emotional conditions indicate a need for guidance by a trained psychotherapist.

Certain assumptions can be made with regard to many of the functional voice disorders under discussion in the present paper. We recognize, or should recognize, that psychological tensions, inadequate adjustment to inter-personal relationships, feelings of insecurity in social situations, long-established patterns of reaction characterized by inferiority feelings, extreme self-consciousness, and the like may contribute to a voice pattern that is unacceptable.

If we proceed to treat patients with such voice patterns in the traditional way, we follow some such clinical

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practice as this: careful and complete anamnesis or case history, test scores that might throw light on the subject's abilities, interests, and achievements evidence from other people who have had contact with the subject. We examine this material carefully, noting all possible contributing factors, and arriving at our decision of the etiology of the disorder. We take pains to explain to the patient the purposes of our collection of the data, and may or may not tell him what our decision is in regard to his problem. In any case, we feel the burden of determining a course of action which we approve, and then proceed to use advice, persuasion, praise or blame, encouragement, and sometimes statements such as, 'I have had the same feeling as you under these circumstances,' or ' I knew a man who felt the same way as you, and he did this or that,' etc. When the patient misses an appointment or fails to show enthusiasm over the progress he is making, or questions our suggestions, we remind him that he must be faithful in his work, that no problem is ever cleared up without effort, and that while he may not see the wisdom of many of the things he is asked to do, he should recognize that every part of the therapeutic program is important and will contribute to his eventual success.

Some or all of these methods are in use in various clinics, and it may be admitted that sometimes a clinician, feeling his own inadequacy and the apparent lack of motivation of the patient, is relieved when the patient discontinues his appointments in the clinic. Too often the final report in such a case sounds something like this: 'Patient not sufficiently motivated,' 'Very difficult person to work with,' or 'Failed to keep his appointments regularly so he really didn't accomplish much.'

It is the purpose of this paper to outline one approach to such a patient and the possible outcomes of its use. This method is called the 'non-directive' type of counseling or, more recently, the 'client-centered' therapy. It is being used with considerable success in child guidance clinics, student counseling centers, social agencies, inter-racial groups, doctors' offices, personnel departments in industry, etc. Reports on the use of this technique appear in psychological journals, and educational and social work publications. However, the literature contains little or no report on its use in speech therapy. The close relationship between voice and emotional states would indicate the importance of the use of any therapy which would reduce tension with its consequent impairment of the speaking voice.

A paragraph from a recent article (4) expresses the fundamental concepts of this therapy:

> The client-centered therapist has learned that the constructive forces in the individual can be trusted, and that the more deeply they are relied on, the more deeply they are released. He has come to build his procedures upon these hypotheses, which are rapidly become established as facts: that the client knows the areas of concern which he is ready to explore; that the client is the best judge as to the most desirable frequency of interviews; that the client can lead the way more efficiently than the therapist into deeper concerns; that the client will protect himself from panic by ceasing to explore an area which is becoming too painful; that the client can and will uncover all the repressed elements which it is necessary to uncover in order to build a comfortable adjustment; that the client can achieve for himself far truer and more sensitive and accurate insights than can possibly be *given* to him; that the client is capable of translating these insights into constructive behavior which weighs his own needs and desires realistically against the demands of society; that the client knows when therapy is completed and he is ready to cope with life independently. Only one condition is necessary for all these forces to be released, and that is the proper psychological atmosphere between client and therapist.

This approach, applied in the speech clinic, means that the clinician does not regard himself as the person who should 'know the answers' to the patient's problem. He need not devise a diagnosis of the specific disorder, and neither is he obliged to outline a series of treatments to effect a so-

called 'cure' for the difficulty. This represents a radical departure from much of our clinical practice. Instead of examining case history material and other data in an effort to decide what is 'best' for the patient, we recognize the clinically established fact that the patient will know what is best for himself *if* he is able to release the 'growth forces' which may have been impeded up to this time.

The clinician using this approach establishes an atmosphere of permissiveness during interviews. The patient finds that whatever feelings he expresses are accepted as his feelings. He is at liberty to terminate the interviews when he wishes. The length of the interview is set in advance and must be terminated at the predetermined time, but the patient is not obliged to stay through that time, and that time is *his* time in which he can express what he chooses, and can divulge what he cares to. There is no probing by the clinician, no reading of deeper meanings into the patient's statements with an effort to make him accept this interpretation, and no criticism when the patient reveals ambivalent feelings or expresses hostility or aggression.

If this atmosphere exists, then what happens? Rogers and Wallen (**5**), in their book on counseling with the returned serviceman, outline the process:

> The individual becomes aware of many of his real motives and attitudes and learns to accept them as a part of himself. (This is very different from *telling him* of his real motives, a step that is nearly always met with resistance and denial.) [This process] leads to a voluntary selection of goals and a considered choice of avenues of satisfaction. The decisions and responsible choices that occur, and the selection of goals that more directly satisfy the real motives, are an experience in psychological growth toward maturity.

In a more recent article, Rogers (**4**) states as follows the elements that are necessary if this process is to take place:

'(1) If the counselor operates on the principle that the individual is basically responsible for himself, and is willing for the individual to keep that responsibility.

'(2) If the counselor operates on the principle that the client has a strong drive to become mature, socially adjusted, independent, productive, and relies on this force, not on his own powers, for therapeutic change.

'(3) If the counselor creates a warm and permissive atmosphere in which the individual is free to bring out any attitudes and feelings which he may have, no matter how unconventional, absurd, or contradictory these attitudes may be. The client is as free to withhold expression as he is to give expression to his feelings.

'(4) If the limits which are set are simple limits set on behavior, and not limits set on attitudes. (This applies mostly to children. The child may not be permitted to break a window or leave the room, but he is free to feel like breaking a window, and the feeling is fully accepted. The adult client may not be permitted more than an hour for an interview, but there is full acceptance of his desire to claim more time.)

'(5) If the therapist uses only those preecedures and techniques in the interview which convey his deep understanding of the emotionalized attitudes expressed and his acceptance of them. This understanding is perhaps best conveyed by a sensitive reflection and clarification of the client's attitudes. The counselor's acceptance involves neither approval nor disapproval.

'(6) If the counselor refrains from any expression or action which is contrary to the preceding principles. This means refraining from questioning, probing, blame, interpretation, advice, suggestion, persuasion, reassurance.'

The actual techniques used by the clinician sound quite simple, but when one realizes the contrast to the usual approach, one can see that complex skills are needed in applying the techniques. This paper can do no more than outline briefly the techniques and refer to Rogers' book (**2**), *Counsel-*

ing and Psychotherapy, and the shorter volume by Rogers and Wallen (**5**), *Counseling with Returned Servicemen,* for a more detailed treatment of the subject.

First of all, the clinician explains the relationship in the interview, as suggested earlier, and then in the course of the patient's remarks evidences acceptance of his feelings by such comments as, 'Yes, I see,' or 'I understand.' The clinician acts as a sort of catalytic agent by reflecting the feelings of the patient, with such statements as, 'You feel that you are unable to change your way of behaving under these circumstances,' or 'That was a difficult experience for you.' In such a psychologically permissive atmosphere, the patient experiences an emotional catharsis, and during this and later gains new insights into his motives and feelings. The clinician can observe then that decisions are made by the patient and choices of action take place.

My own experience in the use of this non-directive therapy is limited but verifies the material in the literature. Since it seemed that my own tendencies were to be highly directive in clinical work, the process was not an easy one to master. A patient whom we shall call Betty came to the clinic and stated that she felt a sense of panic when there was any occasion for her to recite in class, even to read aloud when a group was present. After a couple of interviews, she described, under great emotion, an experience she had had in high school which she felt contributed to her present condition. On many occasions and before large audiences, she had been giving the introductory talk before a song recital by the high school chorus, with no particular fear of the situation. One night, however, before a comparatively small P.T.A. group, she went before the microphone and just as she was about to begin her talk, a boy slipped off one of the boards on which the tiers of singers were standing. She waited for the confusion to die down, but heard behind her 'Oh, oh,' and a whisper that indicated that the singers had interpreted her pause as forgetting. She found that she *did* forget whole passages of her well-learned speech, and she perspired profusely in her effort to reconstruct her remarks. After that she never returned to the speaking situation, and 'begged off' from continuing her part in the program. Before the interviews came to an end—at her own request, incidentally—she had gone into relationships at home and her desire to excel, and had taken definite steps to ask the English teacher to allow her to give oral reports. She found that the excess perspiration which had embarrassed her constantly in class situations was no longer present.

Another patient, Marion, said in her first interview that she wanted to be a teacher, and she defended her wish strongly, admitting that many people had told her she never could enter that field because of her unpleasant harsh voice. Her speech was also characterized by a rapid, jerky rate. After a couple of interviews she broke down one day and told of her problem at home, her father who was a chronic alcoholic, and the confusion in the house, her embarrassment about bringing friends home and the fact that she was obliged to refuse invitations because of the eventual necessity of returning the invitation to her home. She expressed strong feelings of hostility toward her father, and described his threats to throw her out of the house. Before the end of her clinical work, she had opened the subject to her father, he had sensed her feeling of new understanding of him and unburdened himself to her. Her feelings changed from hostility to sympathy for him. She talked over the problem with her mother, a heretofore closed subject between them. She found she could explain to a close friend of hers why she had not invited her to her home. She said one day that she felt that the rapid speech she used was a kind of protection to her, for people then did not ask her personal ques-

tions. Gradually the pace of her speech slackened, and the harshness began to diminish.

It is not strange that we find this permissive attitude permeating other clinical situations, so that a student interrupts his regular work one day and says, 'You may have noticed that it has been hard for me to concentrate on the work. It has been, for I don't know what to do about the situation I am in now. I got married secretly and have not told my parents and my wife has not told hers. Honesty has always been something I prided myself on, and I've always been willing to take the rap if I could get something off my mind, and now here I am caught and don't know what to do.' The interview continued in the manner described above, and at the end of it, he stated that he had made up his mind to tell his wife that they should explain the situation to their parents. It was with considerable relief that he made this statement, and there was no thanks given to the clinician for her help. You see, it *was* his decision.

There are innumerable other examples of the effectiveness of this therapy. Not all cases react favorably to it, and successful results are not always apparent, but one factor in its favor is that no harm is likely to be done to the case by this method as used judiciously by a properly trained psychological counselor.

Although the application of this method in this field is still in the experimental stage, it appears that it will be found useful in relation to differential diagnosis. It may well be that there are certain patients who can more readily gain insight and subsequent ease and control by the use of this type of therapy; we must try to determine which ones they are, just as we should be able to apply our knowledge of extreme deviations in personality for psychiatric referral.

The counselors who have used this approach in other situations have seen the value of verbatim reports of interviews, recorded transcriptions of the conversations, for study and criticism. Many of the articles in the literature quote from such material and provide us with valuable information as to techniques and procedures. It seems that the exploring of this field of therapy is a fruitful one for those of us in speech clinic work, and the use of the method demonstrates that we as clinicians are able to help the patient to help himself, a worthwhile goal for any therapy.

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A Psychosomatic Theory of Stuttering

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There are certain basic facts about stuttering which cannot be explained by theories which stress the functional origin of the disorder. These theories regard stuttering as a psychoneurosis, a personality disorder, or a manifestation of social maladjustment. That emotional and environmental factors complicate and perpetuate stuttering is no new discovery, no matter under what new name the theory is presented. None of these theories, however, is able to explain why throughout the generations stuttering has followed the same definite pattern. Stuttering has always been more common among boys than girls. More males persist in stuttering than females. Stuttering is a childhood disorder and practically always starts with the onset of speech or shortly thereafter when sentence formation and flow of language has become more fully developed.

Constitutional factors in stuttering have also been stressed by many writers on this subject. The nature of these constitutional factors, however, has been left undisclosed. I present here a theory that the primary or basic cause for stuttering is a delay in the myelinization of the cortical areas in the brain concerned with speech. In the stutterer, according to this theory, the speech areas are myelinated at a later age than normal.

I

Most of the nerve fibers of the central nervous system and a high percentage of those in the peripheral nerves are invested with myelin sheaths. (See Figure 1—a diagram of a medullated nerve fiber stained with osmic acid.) The chief constituents of myelin are cholesterol, certain cerebrosides, phospholipins, and fatty acids. The myelin sheath is regarded as having an insulating function and it may also have a nutritive value to the enclosed axon.

Myelinization is regarded as correlated with function. A nerve fiber that has not been completely myelinated may transmit impulses but the resulting action will lack precision and fine coordination. Conduction is also slower along amyelinated nerve fibers. Tilney and Casamajor (**7**) conclude from their investigations that the deposition of myelin is coincident with the establishment of functions. Keene and Hewer (**3**) state that even nine months after birth myelinization of the pyramidal tracts is incomplete.

Observations indicate that the fibers of the olivospinal tract are not even beginning to myelinate at the time of birth. It is only at the age of about eight months that these fibers begin to myelinate, at a time when the infant begins to maintain its equilibrium and to perform such coordinated movements as crawling and standing. Kuntz (**4**) states that the most precise and most completely coordinated reactions of infants are those which involve mainly conduction pathways which become myelinated early. In the spinal cord myelinization begins in the cervical region and progresses downward, in the

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FIGURE 1. Medullated nerve fiber stained with osmic acid (Schafer, in Quain's Anatomy)
a—axone
b—myelin or medullary sheath
c—neurolemma or sheath of Schwann (encloses the myelin sheath)
R—node of Ranvier
N—Nucleus of the neurolemma.

brain it begins in the medulla and progresses upwards.

A normally developed cortex is essential for speech. Nielsen (**6**) has aptly put it that in its totality symbolic thinking and expression is a function of the entire cerebral cortex. It is well established, however, that certain areas in the brain perform certain functions better than the surrounding portions of the cortex. These various cortical areas in the brain are illustrated in Figure 2.

Flechsig (**2**) studied the development of the central nervous system in the embryonic state and in the newborn child. He originated the view that the degree of myelinization of the fibers in the central nervous system is an index of their functional capacity. He found that myelinization proceeds in the following order: (1) the sensory, (2) the motor and (3) the association fibers. Figure 3 illustrates the order of myelinization of the various cortical areas in the brain. The numerals indicate the order of myelinization. Primary is 1 to 10; intermediate, 11 to 31; late, 32 to 36. Myelinization does not proceed at a uniform rate; there are periods of acceleration and periods of decreased velocity. Myelinization may not be complete until the twentieth year of life. Flechsig (**2**) also made the interesting observation that myelinization occurs earlier in the female than in the male. A comparison of Figures 2 and 3 reveals that myelinization of the speech areas is a comparatively late process in cortical development.

The average age of onset of speech for boys is 19 months and for girls 18 months. The observation has also been made that the child born prematurely does not differ in this respect from the normal child. McCarthy (**5**) states that children's speech becomes increasingly comprehensible with increase in chronological age, that it is almost entirely comprehensible by the age of three or three and one-half years, and that this development occurs earlier in girls than it does in boys. In the personality development of the child it has been well established that children go through a period of resistence or negativism during the third or fourth year of life (**1**, 13, 16). With some, this period starts a little earlier, with others a little later. During this period the child requires an especially judicious management.

II

A psychosomatic theory is hereby advanced that stuttering is due to a combination of organic and psychological factors occurring approximately at the same time. The primary basic factor is a delay in myelinization of the speech areas in the cortex. The secondary factor comes in when a child of three or four years of age, having a delay in myelinization, is exposed to undue emotional stress and strain during the negativistic period. This emotional stress will act like a catalytic agent in bringing forth stuttering. If judiciously managed, and if the emotional stress is lessened, his speech will improve, while time

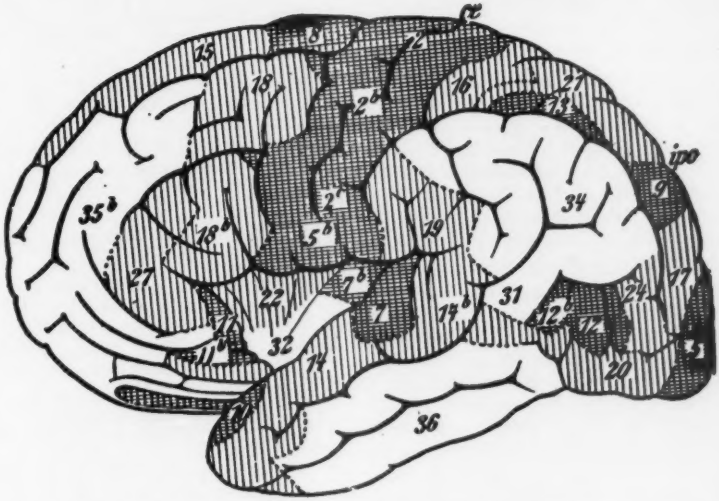

FIGURE 2. Lateral view of the human cerebral hemisphere, showing the cortical areas as outlined by Flechsig on the basis of differences in the time of myelination of their nerve-fibers. The primary areas (first to become well myelinated) are cross-hatched; the intermediate are indicated by vertical lines; the late areas are unshaded. (Lewandowsky.)

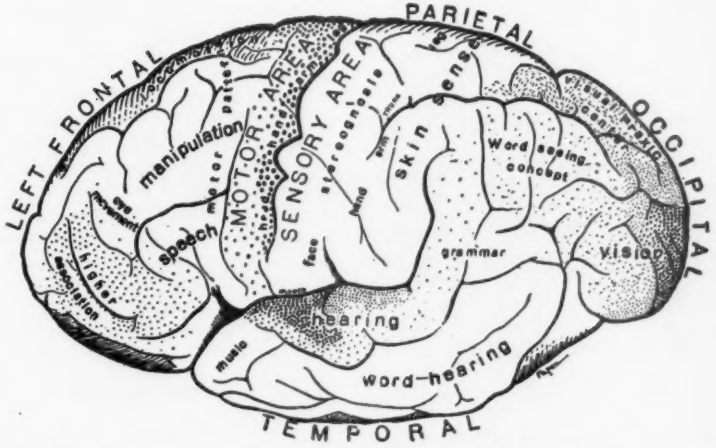

FIGURE 3. Lateral view of the left cerebral hemisphere, showing functional localization. (Papez, *Comparative Neurology*, courtesy of T. Y. Crowell Company.)

is allowed for myelinization to develop so that ability to perform the fine coordinated movements necessary for speech is fully established.

If stuttering continues, emotional factors and habit formation begin to play a greater and greater role in perpetuating this disorder. In the older child and in the adult the emotional factors and established neuromuscular habits become the predominant causative agents of stuttering.

The psychosomatic theory outlined above is offered as an explanation of the fact that stuttering occurs more in boys than in girls. Since myelinization occurs earlier in girls, by the time the girl is three or four years old the myelinization of the speech areas in the brain is apt to be more advanced than that of the boy.

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A University Hearing Aid Clinic

Leroy D. Hedgecock*

THE MATTER of selecting hearing aids has received considerable attention recently. Special interest has been focused upon it by the aural rehabilitation programs of the Army and Navy. Now that the Army hearing centers have ceased functioning it falls largely upon civilian agencies to help render aural rehabilitation service to deafened veterans as well as to expand the service to non-veteran hard of hearing persons. I think the need for this kind of service is too obvious to warrant emphasis before this group, but let us take just a moment to define what we mean by aural rehabilitation.

Aural rehabilitation means, first of all, complete otologic examination and whatever medical treatment is advisable. It means accurate measuring of the degree and type of hearing loss, with prognosis of the condition and determination of the advisability of wearing a hearing aid. The recommendation of a hearing aid entails pressure-free trials and unbiased evaluation of the various instruments in an effort to select the most suitable make and fitting for the individual. This means psychological adjustment to a hearing handicap and in some cases to the wearing of a prosthetic appliance. It means acoustic retraining and development of skills supplementary to audition, such as lip reading, interpretation of tactile impressions, and speech production partially guided by visual, kinesthetic and tactile sensations. And, finally, it means provision for psychologic, psychiatric, and vocational guidance in cases where they are needed.

Since this definition outlines a rather broad field of endeavor we may well ask where a person is to obtain all of this attention. There are a number of civilian agencies that provide at least some of the measures mentioned. Some of these agencies are private otologists, medical clinics, hospitals, college and university speech and hearing clinics, schools for the deaf, leagues for the hard of hearing, hearing aid bureaus, and, of course, the commercial hearing aid distributors.

It seems to me that university facilities offer one of the best possibilities for concentrating the various aspects of this extensive program into an efficient practical procedure. A university hospital or a health service is equipped to provide medical examination and therapy and render at least consulting service in the matter of prescribing hearing aids. The technical procedures of selecting and fitting hearing aids must be done where special equipment has been assembled for that purpose. In at least several universities such equipment and operating personnel have been provided by speech and hearing clinics. It is probable that some university hospitals will soon be equipped to carry out the hearing aid evaluations along with the other medical services. Speech and hearing clinics such as many universities now have are uniquely suited to provide the sensory and motor retraining and to help with the necessary psychological adjustments of handicapped persons. University testing and counseling bureaus or psychological clinics can be called

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upon to furnish informative data and special guidance in whatever psychological or vocational areas are indicated. Cooperation among these various departments is of paramount importance if the whole rehabilitative program is to achieve maximum results.

The Veterans Administration has recognized the impracticality of trying to serve hearing-handicapped veterans from a limited few centers as was done in the services, and is arranging to have the responsibility distributed to thirteen regional areas in the United States, making use of the existing facilities so far as possible. Dr. Conrad Holmberg, a prominent Minneapolis otologist, also on the staff of the University of Minnesota Department of Otolaryngology and former associate of the late Dr. Horace Newhart, has been appointed branch section chief of audiology for veterans in the five-state eighth region by the Veterans Administration. At the present time, Dr. Holmberg is investigating the practices extant and the need for expansion of facilities in his area. He is aiming toward a coordination of the whole program under supervision of the University of Minnesota Hospital's Department of Otolaryngology and wants to utilize the service that can be provided by the University Speech Clinic in the fitting of hearing aids and in speech and hearing retraining for veterans. Dr. Holmberg has agreed to act as medical adviser and consultant for the hearing aid fitting done at the University of Minnesota Speech Clinic.

In addition to assisting as much as possible with the veteran rehabilitation program, the university hearing aid clinic has several other functions. I would say that its first obligation is to cope with the hearing problems of university students, veterans and non-veterans alike. It serves as a training and research laboratory for speech and hearing clinicians. And, to a limited extent, it serves the general public on an outpatient basis. We are and teachers of hard of hearing children in measures that will expedite their educational and emotional development. We make a special effort to give ample time and study to the diagnosis of all children referred to the clinic. It is with some concern that we approach the matter of recommending hearing aids for children since generally we have much less objective information to rely upon than with adults. Decisions have to be made largely on the basis of tentative judgments of probable benefits. In some cases, depending upon the age, development and cooperativeness of the child, a certain amount of definite measure can be obtained by briefing the tests to middle frequency free-field tones and devising short speech reception tests that are within the child's vocabulary. The usual technique of directed activity with pictures and objects can be adapted to use for hearing aid trials. I can see possibilities for use in evaluating hearing aids for children in the children's hearing test for speech that was developed and standardized recently by T. Earle Johnson as a Doctoral dissertation at the University of Wisconsin (**13**). With young children who do not respond to speech nor to the pure tone signal, we have to lean heavily upon the child's observable reaction to the instrument and to the stimulation he receives from it. In choosing an aid for children, considerable weight may justly be placed upon practical considerations such as cast, durability, service facilities, wearing convenience, and the like. A period of trial use under guidance may often be the only determinant of an aid's effectiveness on a child. We do want to encourage the use of hearing aids on children where there is any possibility of providing worthwhile help, but we caution against hasty placing of aids on children without careful guidance in use and evaluation of the results achieved.

Now let us consider a number of questions that must be answered with some certainty before we can recom-

mend a hearing aid fitting for any individual. First, who should be fitted? What degree and what kind of hearing loss is amenable to treatment with a prosthetic appliance? There is no concise arbitrary answer to this—no chart yet devised will guide us unerringly. It depends upon the age of the person, upon his adaptability to new stimuli, and upon his tolerance for unusual sound stimulation. It depends upon the amount of retraining that is feasible and upon the use that is to be made of the corrected hearing.

With these and other qualifying considerations in mind we can make some generalizations. As a rule it is considered impractical to suggest a hearing aid so long as the hearing for speech in either ear is within 35 decibels of normal (**5**). Most of the speech we hear and need to interpret comes to our normal ears at about a 30-40 decibel margin. That is, it could be roughly 35 decibels softer and still be barely intelligible.

At the other end of the scale an 80-decibel loss in the better ear is considered about the limit that can be materially benefited by a hearing aid (**12**). Hearing aid salesmen recite instance after instance of profoundly deaf persons whom they have enabled to hear and understand conversation. That is highly commendable if true, but it is the thought of many that they use the word 'profoundly' loosely. In fairness though, it must be stated that some of the work in the Army rehabilitation centers indicated that with improved instruments and fittings and adequate retraining some losses up to 100 decibels may be ameliorated. It is to be hoped that some of the revolutionary improvements in electronic aids promised as a result of wartime research will soon be more apparent than they have so far been in instruments on the market. When those improvements are in operation perhaps we can reset our sights on the limits of usable hearing. At any rate it is not time to close the book on research in that area.

The second question we have to answer is that of which ear to fit with the hearing aid. Again the answer cannot be condensed into a simple formula. Some workers in the field have long held the opinion that both ears should be equipped with a receiver. Until recently the proponents of bilateral fitting meant to do it by connecting two cords to one microphone and amplifier unit. In that way both ears would receive the same amount and the same pattern of amplification. The fallacy is obvious in cases where the hearing in the two ears differs. The volume of sound would always have to be regulated to suit the better ear in order to avoid unpleasant over-stimulation, and then the poorer ear would not receive enough amplification to improve the unilateral hearing noticeably if at all. In cases where the two ears are of about equal sensitivity there may be some advantage in wearing two receivers from one amplifier, but even then the emphasis on that arrangement seems to ignore the fact that one good ear serves us almost as well as two ears. If we hear perfectly in one ear and not at all in the other the overall loss of hearing is considered to be only about ten or twelve per cent. Another criticism of fitting both ears is that any hearing that may be usable without an aid is interfered with by having tight retainer plugs in both ears. Frequently there are situations where an open unaided ear, even though it is somewhat impaired, will serve functions that a hearing aid will not. By plugging only one ear the other is left to do what it will in the natural way.

At Deshon Hospital some experimentation was done with putting two entirely separate aids on a person. The practice was not extensive and as far as I know the results have not been evaluated conclusively. It does eliminate most of the criticism found with the above described method and probably has some real advantages. Each instrument can be adjusted separately in tone and volume

to the particular characteristics of the ear. It was recommended particularly in some cases that suffered visual impairment as well as auditory. If the two microphones are worn some distance apart on the body it gives the user a chance to develop a sense of something like the space and time relationship of sound that we perceive with two normal ears. It might be arranged to exaggerate the distance between the two microphones by wearing them on the shoulders of a zoot suit and get the effect of radar reception. But whatever the merits of bilateral fitting may be, it is doubtful whether it will become common practice so long as each outfit costs from fifty to two hundred dollars, and so long as two aids are burdensome to wear and care for.

We are still left with the problem of which ear to fit. Again the rules must be qualified, and trial seems the only sure means of ascertaining results. If the hearing is the same in both ears the choice may be made on purely practical grounds of external ear condition and convenience. If one ear is better than the other but both are between the range of 30 to 60 decibels, the recommendation is usually to fit the poorer ear. The poor ear is still such that good amplification should bring it up close to normal and the better ear has enough unaided sensitivity to be very valuable when left unobstructed. When the hearing in either ear is below 60 decibels it is generally advisable to fit the better ear, since improvement there has a better chance of bringing the sensitivity up to a practical point.

Note the opposing principles we have to deal with here. On the one hand the object is to improve the hearing in one ear to as nearly normal as possible. That usually would direct us to place the receiver on the better ear. On the other hand we hesitate to plug the better ear so long as there is any possibility that it will function to some extent without amplification. That tends to direct us to fit the poorer ear, leaving the better one open. Dr. Raymond Carhart summed it up admirably in a recent lecture at Northwesteren University. He said 'the technique of evaluating hearing aids is to pick a sound path through a maze of opposing principles.'

The third question is whether to fit with air or bone conduction. So far we have thought mainly in terms of air conduction, which is by far the more common type. Air conduction is achieved by attaching a small earphone receiver to a retainer plug that fits snugly in the external ear canal. It is important that the earpiece be molded individually for the wearer's ear and that it fit comfortably and at the same time provide an adequate acoustic seal to minimize the sound feed-back or squeal when the volume is turned high. In bone conduction units, instead of a thin diaphragm vibrating as in the air receivers a relatively heavy plate is made to vibrate. That plate must be held firmly against the mastoid process behind the ear by a band over the head. The vibrations are conducted through the temporal bone to the structures of the inner ear and from there on reception is the same as for air conduction. Generally the same microphone and amplifier unit is used for bone as for air conduction, and since the bone receiver requires more electrical energy, the output is usually not so effective. Hence it is in only a small percentage of cases that bone conduction is advised. Bone conduction measured on the audiometer must be markedly better than air to give results comparable to air amplification (5). The frequency response of most bone conduction units is limited to the range between 256 and 2048 double vibrations per second.

One or two hearing aid companies report that they sell about one bone conduction instrument in ten. For most the ratio is less than that. Occasionally bone conduction may be recommended by the otologist because of some pathology or external ear condition. Also bone conduction should be considered seriously when

there is notable advantage in leaving both ear canals open. When bone conduction is indicated, it is advisable, if measures permit, to try the bone unit on the ear with poorer air conduction so that it will not mask air reception in the better ear. The nearest to a rule that is generally given is to recommend bone conduction only when reception by bone approaches normal and the audiogram curve is flat or rising.

The fourth question, and the one most tedious to answer despite the Davis (**6**) report, is that of selecting the instrument, the tone setting, and the receiver most suitable for the individual. There are several principles among which to choose in making a selection. We must decide whether we want the greatest gain in overall sensitivity for sound stimuli, the greatest gain in intelligible speech reception, or the greatest gain in sound discrimination for purposes of speech development. The first of these, gain in sensitivity, probably should be eliminated since we will usually chose either gain for speech reception or gain for speech development. Generally we are likely to emphasize the gain for speech intelligibility with adults and gains for hearing necessary for speech development with children. It is fortunate if these two kinds of gain are achieved to the maximum extent with the same hearing aid fitting. To achieve the kind of gain wanted, we experiment with three general types of fittings: (1) straight-line fitting, which means selection of instrument and adjustment that boost the audiogram curve, leaving it essentially with same shape as with the unaided ear; (2) supplementary fitting, which means selection of instrument and adjustment that amplifiy the most sounds that are heard best with the unaided ear; and (3) complementary fitting, which means selection of instrument and fitting that tend to flatten out the audiogram by amplifying most those sounds that are heard least well by the unaided ear. Frequently some compromise of these principles gives the best results so far as we can measure.

Equipment for a Hearing Aid Clinic

Sound room.

The specifications for a sound room may vary from a highly engineered acoustic laboratory to a reasonably quiet sound-treated chamber. For accurate experimental work, of course, a well insulated laboratory is essential, but for practical clinical purposes a quiet room with low reverberation characteristics and fairly constant noise level is serviceable. If monitored live voice tests are given, a quiet chamber apart from the sound reception room is necessary. It need be only large enough to accommodate comfortably one or two persons together with the control equipment, and it should be treated with absorbent material to reduce reverberation at the microphone. A room simulating ordinary home living room conditions is also advisable for certain parts of the evaluation procedure. The testing of speech reception in normal noise environment is particularly important if the equipment does not include a noise generator in the amplifying circuit. The lack of a highly attenuated room may be compensated for to some degree by use of a sound level meter to record the noise level under which testing is carried on.

Hearing aids.

All, or a broad representative selection, of the hearing aids that are available in the area and that are accepted by the Council on Physical Medicine of the American Medical Association should be on hand to choose from. The arrangements for securing aids for a clinic vary from outright buying to temporary borrowing, but the system we found most satisfactory at Indiana University, and the only one practiced at the University of Minnesota, is indefinite borrowing, with an exchange agreement so that the clinic is always supplied with the latest models of each make of instru-

ment. I might add here that in general the manufacturers and distributors have been very cooperative in supplying their equipment.

Audiometer.

A Council-accepted pure tone audiometer, calibrated for both air and bone conduction receivers, is an essential item. The audiometer should also have a masking noise generator for use in bone and severe unilateral loss testing. It is desirable to have the masking noise represent all tones of the test spectrum in equal degree and to be calibrated in decibel steps. This is a rare feature in current audiometers. A speech circuit with a monitor meter and the output calibrated in decibels is also a desirable feature in the audiometer.

Amplifying system.

The sound room should be equipped with a high grade loud speaker from a high fidelity amplifying system capable of reproducing pure tones from the audiometer and speech from either a microphone or records over as wide a decibel range as is attainable without serious distortion. The system should be controlled by a conveniently operated attenuator calibrated in decibel steps. This set-up necessarily includes connection with a high quality microphone for live speech, with a turntable for records or transcriptions and with an audiometer for pure tone generation. A simple talk-back system from the sound room to the control chamber is also necessary.

Noise generator.

A noise generator that can be controlled in decibel steps over an eighty decibel range and introduced into the amplifying circuit, or conducted by a separate system into the sound room, is desirable equipment that adds to the accuracy of speech reception measures in noise environment.

Sound level meter.

Although not an essential item, a sound level meter is a useful instrument in determining conditions under which you are working and in checking calibrations of other systems. The sound level meter measures in decibels the overall sound pressure at its microphone and has a built in system for checking its own calibrations. It is especially helpful if your other facilities are mediocre and the acoustic conditions are subject to considerable change.

Baffle board.

A simple but important item for maintaining relatively constant background and placement of instruments is an acoustic board in the sound room upon which each hearing aid is fastened during the tests.

Testing material.

The phonetically balanced intelligibility sentence lists published in 1929 by Fletcher and Steinberg (**8**) of the Bell Telephone Laboratories have been used to considerable extent for hearing aid speech reception testing. In 1939, West (**20**), of the University of Wisconsin, published three lists of paired words designed for sound discrimination testing with hearing aids. A list of spondee words with a narrow margin between audibility and intelligibility levels, a set of phonetically balanced word lists, and a list of simple intelligibility sentences were developed and standardized at Harvard Psycho-Acoustic Laboratory for use in the Army and Navy Aural Rehabilitation Hospitals. These lists are now available for civilian clinical use.[1] Central Institute for the Deaf has also standardized various types of speech reception tests and has made records of some of them for phonograph type of testing (**18**). The various records that are designed for phonograph group hearing tests may also be adapted to the testing of hearing aids. A wide selection of commercial records of popular and classical music and recorded speech and common sound effects was used for

[1] *Articulation testing methods.* Office of Scientific Research and Development Report No. 3802. Washington, D. C.: Department of Commerce, 1944.

the listening hour technique which was developed by Miss Laila Larson at Deshon General Hospital (**3**). Many of the hearing aid companies have devised their own word and sentence lists for testing speech reception with their aids. Individual research has produced certain specialized types of speech tests that may be used in hearing aid evaluations.

Procedures for Fitting Hearing Aids

Preliminary screening.

A preliminary selection is made on the basis of comparing the degree and type of hearing loss with the known response characteristics of the various instruments.

Free field pure tone test.

The signal from the audiometer is amplified and delivered through the loud speaker. A threshold reading is taken for this with the unaided ear at a measured distance from the speaker and at a certain location in the sound room. Then the various instruments with selected adjustments are tried at that same location from the sound source. The gain for each fitting is then plotted with the original audiogram to compute the residual pure tone loss with each aid.

Speech reception threshold.

The decibel level at which fifty per cent of the testing material can be repeated accurately is considered the speech reception threshold. At Deshon spondees, two-syllable words with equalized stress, were used for this measure. Other types of speech material may be substituted in this test for experimental or other reasons. If possible, this threshold is obtained without an aid and also with each of the fittings under consideration.

Sound discrimination test.

Lists of paired words differing in only one sound are given at a level 25 decibels above the best aid threshold, and the percentage of accurate discrimination is recorded for each of the fittings. The lists are arranged for discrimination on three pitch levels, with distinction between voiced and non-voiced sounds representing low pitch; vowels, semivowels and nasals representing middle pitch; and fricatives and sibilants representing high pitch.

Intelligibility test.

Phonetically balanced word and sentence lists are given at the best aid threshold level and at 25 decibels above the threshold. Percentage of intelligibile material at each level is recorded for comparative evaluation. The lists used for this test are the Harvard phonetically balanced words and the Bell Laboratory phonetically balanced sentences.

Tolerance for speech.

The decibel level of speech at which tickling or pain sensation is experienced is determined for each aid set at comfort volume and at maximum gain volume.

Speech reception in noise.

Speech reception threshold is determined in natural and controlled noise environments of varying degree.

Trial evaluation.

A scale running from zero for completely unpleasant or unintelligible reception to 25 for very pleasant or intelligible reception is provided for the hearing aid wearer to use in rating the performance of each aid in conversation around the clinic, in listening to a variety of records, and in real situations outside the clinic if conditions permit it. This gives a definite comparative value to the wearer's subjective evaluation of each fitting.

Clinical experience in interpretation of this battery of tests provides a fairly adequate guide in the selection and adjustment of an instrument for an individual at the time of the examination. As a result we are sometimes able to choose one instrument that does a distinctly better job than any other for a particular person. Usually, however, we are able merely

to select two or three aids that perform somewhat better than others for the individual. We can only speculate, or retest from time to time to ascertain how stable the results will prove to be. A training period with supplementary measures is the best insurance of permanent rehabilitation.

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Community Speech and Hearing Clinics

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Those who work in the speech correction field know that most cities provide special speech correction programs in their schools and colleges. In the United States, the hospital speech-hearing clinic is rare, with the exception of the Veterans Administration facilities.

This means that the school and college-age population is cared for through civic and educational funds. However, anyone who works in any large population center knows that corrective work done at the pre-school level would greatly ease the schools' corrective load. Furthermore, some speech-hearing difficulties persist into adult life and others originate then.

Most school system programs cannot provide any facilities for out-age groups because of the scarcity of trained personnel and the load of cases within the schools. The college and university clinics exist largely for observation and student practice. They select only a few cases, either because they are typical of the school problems which students are studying, or because they fit some other research or experimental need. A few cases are seen in college clinics because they are rare or unusual. Service in most of these clinics is limited to times when the college is in session and is only as intensive as is profitable to the student-teacher.

However, in one metropolitan Community Fund clinic, almost one-third of the active cases over the last two-year period have been of pre-school or above-school age. This would seem to indicate that a large part of our speech-hearing defective population is not and will not be served in public school speech correction programs.

We all realize the importance of starting speech therapy for the cleft palate child before the end of the second year at the latest, with intensive periods of pre- and post-operative therapy. The spastic or aphasic child (if he is recognized as such) receives early care in some states through such facilities as the Society for Crippled Children. In many states therapy for the deaf child begins legally at the age of three, although many authorities are beginning to realize that even this age is not optimum in the light of the speech development stages of the normal hearing child. Many stutterers are noticed to block in speech long before they are of school age, some starting at about the age of sentence development, others around the age of four. These children and their parents need facilities for help and guidance if the child is not to become even worse in speech when he enters school. Many school systems prefer not to admit to the first grade children with poor articulation because of the double handicap in learning to read. However, in spite of the fact that the child may be ready in all other respects, barred from school he cannot obtain speech therapy in many communities.

Recent emphasis on 'well-baby clinics' and other public health and welfare agencies might well include speech-hearing centers whose program should aim at prevention, parent education, and parent-child therapy.

Pre-operative therapy for adults who must undergo surgical removal of the larynx should be available

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through some civic program, because early training in esophageal voice has proved to be such an important factor in successfully retraining speech. Post-operative training likewise is required if satisfactory vocational adjustment is to be expected.

Many school graduates who have received aid in speech while in school still require help on the adult level. Of this group, the most obvious is the stutterer, who may require further attention when he is again facing difficult situations, and the adult cleft palate case, whose speech also noticeably deteriorates without occasional practice periods with a trained teacher. Equally obvious, the speech of the hearing-handicapped is likely to deteriorate, particularly if the hearing loss is of a progressive nature. Some hearing losses do not assert themselves until adult life. These cases should not be at the mercy of hearing aid salesmen. They require otological help as well as guidance in hearing aid selection, lip-reading, and, frequently, vocational readjustment. Even a few articulatory cases persist into adult life in spite of school therapy and constitute a severe vocational handicap. Many voice handicaps originate in the stress and strain of adult professional life and require help in adult therapy programs.

The Bureau of Vocational Rehabilitation, through Congressional measures, is prepared to help in the financing of complete rehabilitation programs for most of the aforementioned adult speech-hearing cases. However, most sizeable communities simply do not have facilities for their care.

Although it is obvious that some of the pre-school cases, and an even larger percentage of the adults, are capable of financing their speech therapy in a metropolitan clinic or with a private practitioner, it is absolutely necessary that programs of this nature be provided on a free or ability-to-pay basis for the many who cannot afford it otherwise. Such facilities might be established in well-baby clinics, or as out-patient services of rehabilitation hospital programs. Far more logical is a centrally located single agency.

The programs described above must be financed somehow. They can partly finance themselves, of course, through fees, but many of the cases are unable to pay the costs. It is necessary for state funds from the Bureau of Vocational Rehabilitation to be incremented through an endowment for children's and old age non-vocational services. This endowment might well come from the local Community Fund.

The Cleveland Hearing and Speech Center is such an organization. It is affiliated with Western Reserve University and is a member of the Welfare Group of Cleveland Community Fund Agencies. It is probably the first such Center in the country, but the idea is such a workable one that it might be considered by other communities and by other university speech correction departments.

History and Organization

The Cleveland Hearing and Speech Center is actually a merging of the Hearing Center (the local Society for the Hard of Hearing) with the Western Reserve University Speech and Hearing Clinics. It is a separately incorporated organization functioning on the University Campus under a board of medical, professional, and lay directors. Its professional staff members have University rank and teach courses in their specialties at Western Reserve University. The aims of the Center are: (1) to serve the people of Cleveland who need various kinds of speech and hearing therapy in cooperation with the medical profession and other local and national rehabilitation agencies; (2) to prepare a group of young clinicians through the usual classroom program, using the unusually comprehensive clinical facilities which only a large metropolitan Center can offer. The final aim of the Center is eventually to contribute to knowledge in the field

of speech and hearing therapy through research on large numbers of cases.

Evaluation

At the time of writing this article, the program is only a year and a half old. Yet representatives from other communities, either from societies for the hard of hearing or from other university speech clinics, come to us now and then asking if it has worked.

Our answer is that it seems to have worked well from everyone's point of view. The community is best served by a university-staffed and affiliated Center because in this way it can be assured of obtaining and keeping excellent personnel. Furthermore, professors from the fields of psychiatry, psychology, related medical specialties, and applied social science are available to contribute their advisory services to keep the program well-rounded.

The community also profits by the fact that inexpensive but well-trained personnel under expert supervision is available at teaching Centers, and this keeps the number of cases served per dollar amazingly high.

The community further profits by the fact that many of the people who normally avoid welfare agencies do not hesitate to go to an agency which is located on the University Campus and which is affiliated with the University. The community also benefits by the enlarged vision which the staff obtains from its dual role of professor and clinician, however strenuous it may be for the staff at times.

The University is also benefited by the presence of this affiliated agency upon its campus, because it can thus provide a more complete training program than would ordinarily be available to its students. Furthermore, University students can have a much more complete clinical screening and therapy program than universities can offer otherwise. Coordination among the Student Health, the Student Deans, and the Vocational Advisors can truly serve the student better than the average university program.

Finally, the program works well because it can attract and keep only those clinicians who are intensely interested in clinical work. There is little danger of *'ivory tower'* teaching in such a busy Center where 400 individuals come each month (some of these for many consecutive months) to attend a club program, to receive speech therapy, a hearing test, or hearing aid advice.

We strongly urge that other university and city agency programs consider the possibility of university-affiliated speech and hearing centers in future planning. School and college programs cannot adequately fulfill the community demand, especially in the pre-school and adult groups. Community speech and hearing clinics might well be established nationally as Public Health Community Fund projects.

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Speech Correction in the Rochester, New York, Schools

Grace T. Brown*

ONE OF THE MAJOR problems met by the teachers in our schools in the years prior to 1913 was that of the child who, through lack of training, was unable to measure up to the standard of clear, distinct speech.

Broken lisping syllables and the quaint baby talk of a three year old might have appealed to some as having a certain quality of attractiveness, but when the serious work of the grades was begun it was very definitely a handicap, esepecially in the learning-to-read situation which requires reading aloud to others so that they may be understood. Speech is not just 'sounding off' but is speech only when it can be interpreted by the listener. It is true that as a child learns to read through the medium of phonics some of the infantile substitutions are dropped, but when incorrect muscle habits have been established it is as difficult, if not more so, to correct speech habits than other incorrect muscular patterns.

Until September, 1913, the teachers in the schools of Rochester, New York, struggled with this problem as best they could. Some minor defects were corrected in the primary grades, but stuttering and other major defects grew worse rather than better and many of our boys and girls were indeed suffering embarrassment and hardships because of their speech handicaps.

This problem was investigated by the head of our Special Education Department, Miss Grace Boehne. Her report on this investigation was presented to our Board of Education. This resulted in the initiation of a workable program, and the great privilege and honor of organizing this very important work was given to me.

A list of the children who needed help was given to me by the teachers in one school district. Parents were interviewed. Though many were very skeptical of my ability to correct such a condition as stuttering, others gladly consented to transfer their children to No. 12 School that they might have the advantage of corrective speech lessons.

I

Our first class in corrective speech was formed at No. 12 School in the latter part of September, 1913. It was a class of 34 children made up of stutterers, lispers, and other types selected from No. 12 and surrounding districts. This class was at first in the nature of an experiment. The average layman had not heard much about speech correction in those days. If a child was 'born a stutterer,' well, 'it was just one of those things which couldn't be helped.'

The class had many and frequent visitors. Members of the Board of Education, the Superintendent of Schools, school principals, and many parents came to see 'just what we were doing and *how* we were doing it.' They came, they saw, but *we* conquered. At the end of the first year the Board decided that corrective

*Miss Brown is Speech Specialist in the Rochester, New York, schools. She was trained primarily to teach the deaf and taught for two years in the School for the Deaf in Mt. Airy, Philadelphia, Pennsylvania, and five years in the School for the Deaf in Morganton, North Carolina. It is one of the important functions of the *Journal* to provide a record of matters that are of historical as well as currrent interest in speech correction. Miss Brown's article recounts the beginnings and the development of one of America's oldest public school speech correction programs.

speech work was no longer an experiment but that it filled a very definite need as a part of the school curriculum. The following year another teacher was employed, and during that year we serviced eight elementary schools.

Under the direction of the No. 12 School physician, Dr. Button, case history cards were prepared. Then we began physical examinations of the most serious cases. If the doctor found any anatomical defect or any physical handicap which needed attention, recommendations for the treatment of such were sent to the parents. We followed this by visits to the homes or conferences with the parents either by the teacher or school nurse. Some of the parents contacted Dr. Button and talked with him, not only about treatments for their children but also about 'this new idea.' Mr. and Mrs. John Q. Public were severe critics, I assure you, and they wondered audibly 'just who does Miss Brown think she is, that she can "cure" stuttering? My boy was born that way,' etc.

Soon, however, most of these 'doubting Thomases' were convinced of the ultimate success of our approach to correct speech which would so enrich the lives of their children, give them poise and self-confidence, thus enabling, them to take their places in society, to become successful business men and women, to be able to stand on their own two feet and talk smoothly, fluently, and intelligibly.

In September of 1916, Miss Edith Scott, who had succeeded Miss Boehne, began to develop a workable program for our hard of hearing children. A class was organized in one of our elementary schools and taught by an experienced teacher, Miss Alice Howe. This program proved to be so successful and to fill such a definite need in this public school that classes in other schools were soon organized.

In the latter part of that year, as a medical project, Dr. Franklin Bock, one of our local otologists who is known as a pioneer in the field of public audiometry, opened a clinic in one of the elementary schools for the purpose of giving the children medical care and advice in order to prevent the many ear, nose, throat, and mouth conditions so prevalent among children. We believed these conditions to be the incipient causes of future deafness.

The clinic which was started was unique in two particulars: it was probably the first clinic of its kind in the country, and it set up no economic barriers between any child and the care he needed to improve his health.

Children were tested first by tuning forks, later by a phono audiometer and in 1925 by a 4A audiometer which was loaned to Dr. Bock by the Western Electric Co. In 1927 the Board of Education purchased a 4A audiometer and a trained teacher was employed to test the children. Those who had a high degree of hearing loss were recommended to the lipreading class which was in charge of a well-trained teacher. Running ears were treated and the parents and school nurses instructed in the proper care of the ear.

The otological findings together with notes of any treatments given and suggestions for medical or educational attention were recorded on the hearing test blank; thus all data were on the same sheet. This is still our procedure. When the otological survey is completed, a summary of the findings is prepared and sent to the principal of the school and to the school nurse. Through the nurse, the parents are advised as to the individual needs of their children.

Children with bad teeth are referred to their own dentists or to the dental clinic. Tonsillectomies are referred to the hospital clinics.

One of the most valuable parts of our present day program is the service given by our otologist, Dr. Lawrence Nacey, who is employed by our Board of Education to carry on this work. The clinic is now held at the Education Building where the parents are

interviewed and instructed in the care of their children.

Some of our best students, who were thought to be mentally slow, were found to have hearing losses so serious that they could not hear explanations or instructions given by their teachers. As soon as their hearing difficulties were brought to the attention of their teachers, front seats were assigned to them from which they could not only hear more but could see to read the teacher's lips more readily. All hard of hearing students were and still are assigned to front seats and given every advantage in the classroom.

Lipreading is not a substitue for good hearing but it is a very effective adjunct to poor hearing. It has helped and still is helping these children to keep up their classes when, without it, they would almost certainly fall behind. It is also an excellent means by which concentration is taught.

Added to the economic saving is the important social service of supplying the child with something to augment his reduced hearing when he takes up his life work.

II

Our department grew from year to year. Speech and, later, lipreading teachers were added. In the fall of 1931 we had eight speech teachers and two teachers of lipreading, each servicing on the average of three schools per week during the year. Four high schools were now being serviced and the majority of our elementary schools, both in speech and lipreading. The speech teachers taught lipreading also.

The teachers met the faculties of their individual schools and talked with them about the follow-through work to be done in classrooms. The homes of our speech and hard of hearing students were visited at least twice a year. By contacting parents at home or by appointment at school, we gradually broke down the walls of resistance and before long won their confdence. This was quite essential in order to obtain adequate case histories.

In the early days the history of a stutterer, for instance, was difficult to get because the parents thought the teacher was encroaching upon 'something not her business.' Gradually, however, they became more cooperative, giving us the desired information which helped so much in diagnosis and treatment. These histories were discussed with physician and psychologist. Some of our students were sent to the psychiatrist for further study and help. Our classes now consist of pupils having functional and organic defects, both general and specific.

Under the New York State law provision is made for the physically handicapped child. Under this law many cases are operated upon and treated free of charge in our hospital clinics. Surgical procedures range from a clipped frenum to cleft palate operations by our best oral surgeons. Teeth and jaws are remodeled by skilled orthodontists, thorough eye and ear examinations and tonsillectomies are performed by specialists. Medical attention is given in certain cases by a pediatrician, and home and school counselor services are provided. We have excellent cooperation of all agencies involved. All pupils are planned for according to their needs. Appointments are made through our school nurses. In our physiotherapy departments, parents are shown therapeutic methods favorable to retraining in the home. The remedial services given to our boys and girls are indeed comprehensive, and few appointments are broken.

Our department continued to grow, spreading through the city, and by 1931 we were servicing on the average of 200 cases in secondary schools and approximately 800 to 900 in the elementary schools per year. Little did we know that before another year had passed most of this excellent work would be eliminated. Disaster struck us, as it did so many other or-

ganizations in 1932. Our Board of Education suffered financial reverses and felt, much to their deep regret, that cuts in several departments throughout the city had to be made. Our speech department was reduced to two teachers who continued to service the secondary schools. We taught lipreading as well as speech in these schools. Two teachers of lipreading took over the hard of hearing classes in as many elementary schools as was humanly possible. For one and a half years the elementary schools had no speech services whatever. We weathered this blow, however, and came up for air in the fall of 1933. One of our speech specialists, Miss Kathryn Kirk, was reinstated in our department as a demonstration teacher and speech examiner for elementary schools. I mention this teacher's name because I feel very strongly the great value of her excellent work and wish to acknowledge it publicly.

Because there were no speech teachers in the elementary schools, Miss Kirk's program consisted of examining the children referred by grade teachers, psychologists, nurses, or home and school counselors. For several years Miss Kirk worked alone in the schools, servicing about twenty schools per year, meeting teachers, and giving demonstration lessons. These lessons consisted of speech improvement for all pupils and corrective exercises for those with definite needs. This procedure, however, proved to be too narrow in scope, and very shortly all parents were invited to meet with Miss Kirk to be shown the speech needs of their children and exercises to be used in the home. Children were referred to the nurse, doctor, psychologist, or school counselor to meet special problems as they arose. All this involved meeting P. T. A. groups also, thus building up a demand for more speech teachers.

At this time there were 42 elementary schools in Rochester. For several years Miss Kirk went from school to school trying to meet the needs and demands of the speech handicapped children. Reports of each case were made out meticulously and in great detail so that when these children entered high school we, who were teaching there, had a very definite and clear picture of each case. This, as you can readily see, was most important and of very great value to us.

III

Our department now consists of seven speech teachers who also teach lipreading. Besides this number there are two teachers for the hard of hearing classes in one of our elementary schools, who service the children with hearing losses so serious that they require special attention in the school program. While their hearing losses are indeed serious, they are not severe enough to warrant placement in our School for the Deaf. These children receive instruction in the regular curriculum by means of lipreading and sound amplifiers if need be. Speech correction exercises are also given.

In order to give some definite idea as to the number of pupils given speech correction, I quote from a report of the year 1945-1946.

Average no. elementary schools completely surveyed (Partail surveys of several others)	15
Average no. elementary schools given office service	26
Average no. elementary schools given special case service	31
Total no. pupils examined by Miss Kirk	790
Total no. pupils examined by three speech correctionists	1762
Total no. pupils given instruction in 20 schools	963
Total enrollment in elementary schools	10757
Average percentage treated	11.3%
Enrollment in 7 secondary schools	10114
Average percentage treated	6.1%

My program consists of service in two secondary schools, three days in one school and two days in the other. Our schedule consists of six 50-minute periods. I plan to meet six groups a day, each group averaging from eight to ten students, ranging in grade from the 8th through the 12th year.

If possible, lipreaders and those students having major speech defects meet twice a week; the others report to class but once a week. The average number of students treated during the year is approximately 175.

Three of our secondary schools receive no speech or lipreading services. This is regrettable—and challenging. Year after year, boys and girls who, in their first years of high school could not recite, depending upon written work for passing marks, have returned to tell us of the excellent positions they hold—as teachers, lawyers, bankers, ministers, salesmen—all positions which require smooth speech. How glad and appreciative they are that they were fortunate enough to be registered in a school which had speech classes. It is a great satisfaction to us, as teachers, to realize that we have helped to place 'square pegs in square holes,' to help these men and women to reach otherwise unattainable goals.

Our need for more teachers is great. We hope that the near future will see our speech department enlarged to the extent that each and every school, elementary and secondary, will be adequately serviced, and every boy or girl who needs speech training or lipreading may have it.

I cannot bring this article to a close without calling attention again to what can be accomplished by the coordinated effort shown by the complete and interested cooperation between our Board of Education, our Special Education Department, our public spirited and big-hearted surgeons, dentists, doctors, nurses, hospital superintendents, and home and school counselors who give so freely and generously of their time and skill in order to help our boys and girls take their own places in society.

JOURNAL OF SPEECH DISORDERS, 1947, **12**, 339-341

Bibliography: Esophageal Speech

Jack L. Bangs*

BRIGHTON, G. R. and BOONE, W. H. Roentgenographic demonstration of method of speech in cases of complete laryngectomy. *Amer. J. Roentgenol.*, 1937, **38**, 571-583.

This article presents roentgenography as a method of investigating esophageal speech. The article contains a good basic statement of the problems of the user of esophageal speech, the physiology of the esophageal voice, and general therapy. The following conclusions are presented:

1. With complete laryngectomy, patients are able to talk within a variable period of time, usually from three to six months.
2. As demonstrated in certain lower animal forms, audible tone production is possible with an entire absence of an anatomical larynx. Tone production in these cases is dependent on some membranous development in the respiratory tract other than in the larynx.
3. As demonstrated roentgenographically, the mechanism of speech in patients following laryngectomy is dependent on an air column furnished by a pseudoglottis.
4. The action of the pseudoglottis is similar to that of a normal glottis, the vibrating membrane of the trachiobronchial tree of certain lower animals or the reed of an artificial larynx.
5. In cases I and II, the pseudoglottis was formed at the anatomical position of the cricopharyngeus muscle.
6. The air column was furnished by the aspirated esophageal air.
7. Before some voluntary control of the air aspiration mechanism is developed, the speech of these patients is limited to a whisper, depending on the small amount of air normally in the pharynx.

BROWN, R. G. A simple but effective artificial larynx. *J. Laryngol., Otol.*, 1925, **40**, 793-797.

The author reports making an incision into the pharynx slightly above the excised larynx. A pitch pipe was placed in the resulting fistula. An air-tight plate was made to fit over the trachial opening and pharyngeal opening, thus directing air into the pharynx. Lifting of the chin broke the air-tight aspect of the shield and allowed breathing. The resulting voice was described as loud and clear but monotonous.

BURGER, H. Speech without larynx. *J. Otol., Laryngol.*, 1925, **40**, 789-792.

The report of a case of what the author terms 'esophagus speech.' The patient was reported to have a normal two-octave range and to speak clearly but low. Laryngoscopic examination revealed the fact that the site of the pseudoglottis was at the mouth of the esophagus and that in quiet respiration this mouth was always wide open. This is distinctly contrary to the opinions of numerous other writers who feel that the cricopharyngeus mouth must be closed tonically for good speech development.

GATEWOOD, E. T. Development of speech after laryngectomy. *South. Med. J.*, 1943, **36**, 453-455.

A general discussion of the possibilities of developing esophageal voice after laryngectomy. The author advises surgeons to preserve the cricopharyngeus muscle and the superior-inferior branches of the laryngeal nerve.

GREENE, J. S. Composite postoperative therapy for the laryngectomized. *Laryngoscope*. 1943, **53**, 13-16.

A general discussion of the possibilities of voice, pseudo or mechanical, with emphasis on the pseudo. The author introduces a mechanical larynx of a new type. This is not a particularly good general reference for this subject.

GUTTMAN, M. R. Tracheohypopharyngeal fistulization, a new procedure for speech production in the laryngectomized patient. *Trans. Amer. laryngol., rhinol., otol. Soc.*, 1935, **41**, 219-226.

This article contains some discussion of the history of artificial larynges and pseudo voice and a description of an operation whereby a fistula is formed between the tracheal opening in the neck and the hypopharynx which is used for speaking. Results in three cases were reported as good.

HANSON, H. V. Carcinoma of the larynx; laryngectomy; artificial larynx. *Med. Bull., U. S. Vet. Admin.*, 1936, **13**, 61-63.

This is a description of a case in which the patient made a very satisfactory adjustment to an artificial larynx.

HANSON, W. L. A new artificial larynx with a historical review. *Ill. Med. J.*, 1940, **78**, 483-486.

A good review, from a historical viewpoint, of the development of the artificial larynx. A new artificial larynx design is presented.

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HOSHINO, T. Complete extirpation of the larynx in carcinoma. *Ann. Otol., Rhinol., Laryngol.*, 1919, **28**, 466-472.

A general discussion of the operation and a description of two artificial larynges.

IGLAUER, S. Artificial larynx, with patient demonstrating its use. *Ann. Otol., Rhinol., Laryngol.*, 1936, **45**, 1176-1177.

This description of an artificial larynx contains a diagram of a reed-type larynx. The article is is of little general reference value.

JACKSON, C. L. The voice after direct laryngoscopic operations, laryngofissure, and laryngectomy. *Arch. Otolaryngol.*, 1940, **31**, 23-36.

This author suggests that esophageal speech is indicated in cases of total laryngectomy and suggests a specific course of therapy for speech training. The results of a questionnaire are presented, which indicate:

1. The majority of people are able to develop esophageal speech and to resume their original occupations.
2. The majority of these people consider esophageal speech a satisfactory substitute for normal speech.
3. An artificial larynx is recommended only in case of inability to develop voice without it.

KALLEN, L. A. Vicarious vocal mechanisms: the anatomy, physiology, and development of speech in laryngectomized persons. *Arch. Otolaryngol.*, 1934, **20**, 460-503.

This is an excellent discussion of the development of esophageal speech, and contains a very complete coverage of foreign, especially German, literature. There is a considerable discussion of artificial larynges. It is the best single article in the present bibliography.

LEVIN, N. M. Teaching the laryngetomized patient to talk. *Arch. Otolaryngol.*, 1940, **32**, 299-314.

A good discussion of the physiology, psychology, and training of an esophageal speech patient. The article contains a good outline of procedures for retraining speech, and is one of the better articles on the subject.

LINDSAY, J. R., MORGAN, R. H. and WEPMAN, J. M. The cricopharyngeus muscle in esophageal speech. *Laryngoscope*, 1944, **54**, 55-65.

A good discussion of the general problem of esophageal speech and an extensive discussion of the use of fluoroscopy and roentgenography as methods of investigating esophageal speech. The author stresses the importance of action of the cricopharyngeus muscle. There is some discussion of therapy.

MACKENTY, J. E. Technique and after-treatment of hemilaryngectomy and laryngectomy. *J. A. M. A.*, 1917, **69**, 863-869.

A discussion of the operation and after-care, including diet. Very little information is contained in this article so far as esophageal speech is concerned. Some mention is made of artificial larynges.

————. Operation of total laryngectomy for cure of intrinsic cancer of the larynx. *Ann. Otol., Rhinol., Laryngol.*, 1922, **31**, 1101-1117.

There is one short reference to speech in this article in which the author states that one patient was able to open his esophagus, swallow a stomach full of air and count up to twenty on one stomach-full. This patient was also reported as being able to be understood over the telephone. There was no mention of the sound source.

MCCALL, J. W. Preliminary voice training for laryngectomy. *Arch. Otolaryngol.*, 1943, **38**, 10-16.

A good discussion of physiology and preoperative training. The author feels that patients who are to be subjected to total laryngectomy should have voice training before, as well as after, the operation. It is a well-developed theme and an excellent article.

————and STOVER, W. G. Laryngectomy for laryngeal cancer: a review of 45 cases. *Laryngoscope*, 1944, **54**, 659-676.

This is primarily a discussion of the operation and medical treatment. There is some discussion of the need for pre-operative training, which the authors feel is essential for the development of good esophageal speech. They mention the vibratory area as being the 'cricopharyngeal space' which has been 'narrowed' by the operation and creates sound vibrations when a sufficient volume of air is expelled from the esophagus.

MCKESSON, E. I. A mechanical larynx. *J. A. M. A.*, 1927, **88**, 645-646.

This is a description of a reed type of mechanical larynx similar to the ones now in use.

MORRISON, W. The production of voice and speech following total laryngectomy. *Arch. Otolaryngol.*, 1931, **14**, 413-431.

An excellent article which covers physiology and history in some detail and gives good advice as to therapy. The article is quite detailed and has an extensive bibliography, mostly German.

————. Physical rehabilitation of the laryngectomized patient. *Arch. Otolaryngol.*, 1941, **34**, 1101-1112.

This is one of the better articles and includes some very good information on X-ray studies. The last of the following

conclusions, however, seem a little drastic and unnecessary:

1. In the late postoperative period the laryngectomized patient is apt to suffer from mental depression because of the social and economic barriers and burdens imposed on him by total aphonia.
2. The best cure for this depression is a well-guided attempt to learn to produce and use pseudo voice.
3. The mechanism of such speech is simple. It can be learned by any patient of average intelligence and vigor if he tries patiently and is guided by an interested and sympathetic physician.
4. The advantages of pseudo voice over any other substitute for the lost voice are numerous and they are entirely practical. Life after the removal of the larynx for cancer cannot be the same as before. The laryngectomized patient must be guided, instructed, controlled, and supervised for at least five years after the operation. The management of this physical and mental rehabilitation should rest in the hands of a practicing otolaryngologist.

NEGUS, V. E. Affectations of the cricopharyngeal fold. *Laryngoscope*, 1938, **48**, 847-858.

This author stresses the importance of the cricopharyngeus fold to esophageal speech following laryngectomy.

————. *Mechanisms of the larynx*. St. Louis, Mo.: Mosby, 1929.

Esophageal voice is mentioned in connection with the cricopharyngeal muscle as pseudo vocal bands.

ORTON, H. B. Review of diseases of the larynx. *Laryngoscope*, 1940, **50**, 158-163.

This is a brief statement to the effect that people can develop pharyngeal speech after total laryngectomy.

ROMONECK, P. L. Artificial and pseudo-voice following complete laryngectomy. *Nebr. Med. J.*, 1932, **17**, 238-243.

The author evidently believes that the position of the pseudoglottis is formed by the back portion of the tongue and pharyngeal wall. It is a good article.

SCHALL, L. A. Psychology of laryngectomized patients. *Arch. Otolaryngol.*, 1938, **28**, 581-584.

A brief but good discussion of the psychological problems confronting the postoperative laryngectomized case. Some of the factors reported as causing emotional shock are:

1. Inability to utter a sound.
2. The changed feeling concerned with breathing.
3. Loss of the sense of smell.
4. Changed taste of food.
5. Inability to cough.
6. Due to his peculiar voice, the case is often an object of curiosity.

SCRIPTURE, E. W. Speech without using larynx. *J. Physiol.*, 1916, **50**, 397-403.

A report of a case of speech which was present although the larynx itself was occluded and no air could get from the trachea into the pharynx. The author states that the air reservoir was located in the hypopharynx and tone was produced through vibration of the soft palate and tongue. Changes of pitch occurred through changes in the tenseness or tonicity of the tongue. Some smoked drum records of the subject's voice are included in the article.

SEEMAN, M. Speech after laryngectomy. *Cas lek. cesk.*, 1924, **63**, 984-994. Continued, 1924, **63**, 1011-1021. (Abstract is in *J. A. M. A.*, 1924, **83**, 484.)

(Abstract) Therapy includes use of esophageal voice. Patient is taught to aspirate the air into the upper two-thirds of the esophagus. The author does not believe that the stomach acts as a reservoir. He goes so far as to say that he feels no air reaches the stomach during esophageal speech swallowing.

SOLIS-COHEN, J. Return of voice after laryngectomy. *J. A. M. A.*, 1893, **21**, 834-838.

The author discusses a patient who recovered speech after total laryngectomy. The physiologic explanation is quite similar to that presented in much more modern studies. He mentions artificial larynges and presents the same objections now voiced concerning their use.

SYMONDS, C. A note on the later history of four cases of total laryngectomy. *Lancet*, 1920, **1**, 652-653.

The author reports four postoperative cases from the medical standpoint. All four cases used a speaking tube containing no reed for tone. There is no mention of esophageal speech.

SYMONDS, J. Total laryngectomy: indications for and results of the operation. *J. Laryngol., Rhinol., Otolaryngol.*, 1920, **35**, 257-263.

A general discussion of the medical aspects of the operation. Two of the six cases presented have 'speech.' One used buccal whisper and the other a tracheal or speaking tube. The author was quite pleased with their voices, and this article is included only because it shows the relatively recent recognition of the practicalness of esophageal speech.

ZINN, W. F. Laryngectomy. *Trans. Amer. laryngol., rhinol., otol. Soc.*, 1933, **39**, 471-480.

Some discussion of the psychology of the operation is contained in this article. It is not the author's opinion that the patients are depressed after this operation, but rather that they are relieved by the fact that the cancerous condition is gone.

News and Announcements

Miriam D. Pauls, Editor*

THE ANNUAL meeting of the Consultants on Audiometers and Hearing Aids of the Council on Physical Medicine of the American Medical Association was held in Chicago on July 26 and 27, 1947. Dr. William Grove, Milwaukee, Wisconsin, is chairman of the group. Among the considerations were requirements for acceptance of audiometers and hearing aids, the present status of fitting of hearing aids, advertising for aids, and supply and standardization of batteries. On Sunday the committee met with representatives of the manufacturers for a frank discussion of mutual problems.

A very interesting panel discussion on deafness was part of the Friday, June 13, 1947 program of the section on Laryngology, Otology and Rhinology of the American Medical Association. Dr. Francis L. Lederer, Chicago, was moderator. Other members of the panel were Dr. Edward H. Truex, Hartford, Conn., Dr. Harold Westlake, Evanston, Ill., Miss Eva Thompson, Philadelphia, Pa., Dr. Herbert Koepp-Baker, Chicago, Ill., and Dr. Charles Kinney, Cleveland, Ohio. Each participant discussed three vital questions to show what can be done and how to rehabilitate the patient with a hearing impairment.

The Army has recently completed a movie which is designed to provide a historical record of the Army Aural Rehabilitation program. It portrays the program as carried out at one of the three army centers, Borden General Hospital, Chickasha, Oklahoma. The actual shooting of the film was done at a New York studio with a group of professional actors. Great care was exercised to duplicate the hospital scenes. Professional groups may obtain the loan of the movie by writing the Surgeon General of the United States Army.

Dr. Helen Shick Lane, Principal of Central Institute for the Deaf, St. Louis, Mo., was elected president of the National Forum on Deafness and Speech Pathology. The meeting which was held at Dayton, Ohio, on March 14 and 15, 1947, was the 29th annual meeting of the organization.

Dr. Sarah Stinchfield Hawk reports a great interest in speech pathology on the part of the veteran graduate students who have come back to complete their college work. She is on the faculty at Scripps College and Claremont Colleges Graduate School, Claremont, California.

A new sixpage leaflet entitled *Psychiatry*, by Florence L. Rome, has just been issued by Occupational Index, Inc., New York University, New York 3, N. Y. A thorough survey of the field, this pamphlet is now available for 25c, cash with order. The leaflet contains information on the growth of psychiatry, future prospects, description of the work, qualifications and preparation necessary, methods of entrance and advancement, salary ranges, number and distribution of doctors already in the field, advantages and disadvantages. Sources of further information are listed and selected references for additional reading included.

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'Slidefilms and Motion Pictures—To Help Instructors' is the title of a new catalog of selected visual teaching aids produced and distributed by the School Service Department of The Jam Handy Organization. This booklet lists discussional slidefilm kits, sound slidefilms, and educational sound motion pictures for vocational training and classroom use. Free copies of this new catalog may be obtained by writing to The Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan.

The Cleveland Hearing and Speech Center has announced the opening of a training program for executive secretaries for Societies for Hard of Hearing. The great need for executive secretaries throughout the United States has prompted the offering of this program.

Persons who have had adequate training in hearing and speech therapy will be required to take courses in social administration and social case work. Those who have had training in social work will be required to take courses in speech and hearing therapy. Persons in either of the above classes require about one year of training. If students have had no training in either of these courses, the preparation would require two years or more.

Inasmuch as the social administration courses are of graduate caliber, the applicants will be required to obtain admission to the graduate college. By special permission, however, experienced persons who have had several years of college work may be admitted after submitting credentials and past experience.

The students will be given adequate training in hearing and speech therapy, job placement and will have considerable clinical experience in hearing and speech therapy, especially in group work. Considerable opportunities will be given to develop skill in guiding social groups by means of the numerous club activities in the Center.

Evanston, Illinois, is planning a model hearing survey of all the school children in the area. There are three features to the project which may well produce significant findings. First, all the medical, educational, and social service agencies are mobilized to carry out an integrated hearing conservation program for every child with a hearing loss. Second, a variety of testing techniques will be employed, including group pure tone audiometry, to determine the relative efficiency of the different methods. Third, there is a study of fluorine concentration on teeth being carried on in the district. There is suggestive evidence that hearing losses occur where there is no fluorine in the water. Control groups will provide evidence to support or disprove this theory. Miss Jane Gaff will conduct the survey.

A step toward alleviating the shortage of professionally trained personnel in treating cerebral palsy, which often involves speech disorders, was the grant of $5000 yearly for graduate scholarships to the Cerebral Palsy Division of the National Society for Crippled Children and Adults by Alpha Chi Omega, national women's fraternity.

Graduate scholarships will be given to speech, occupational and physical therapists, special education teachers, and physicians. The allotment will cover maintenance and tuition for study at a recognized training center for a minimum of three months.

Miss Jane Shover, Chicago, director of the Cerebral Palsy Division, has emphasized the great need that exists for speech therapists to treat children with cerebral palsy, who number over 200,000.

Recipients of the scholarships will be selected by the National Society's cerebral palsy medical advisory committee, and the Cerebral Palsy Division. Mrs. Ivan L. Willis, Flossmoor,

Ill., will represent Alpha Chi Omega on the board. Authorities on the medical advisory council include Winthrop M. Phelps, M.D., Baltimore, Md.; Earl R. Carlson, M.D., Pompano, Fla.; Bronson Crothers, M.D., Boston, Mass.; George G. Deaver, M.D., New York, N. Y.; Temple Fay, M.D., Philadelphia, Pa.; Meyer A. Perlstein, M.D., Chicago, Ill.

Due to an oversight, the 1947 speech clinic program of the University of Illinois was not included in the News and Announcements in the June 1947 issue of the *Journal*. This clinic, under the direction of Severina E. Nelson, offered for the third summer intensive internship training for graduate speech correctionists during the eight weeks summer session. Forty children, including cerebral palsy, cleft palate, and hard of hearing cases, were examined in the clinic for diagnosis and therapy by the Division of Services for Crippled Children. The children, ranging in age from 7 to 16 years, were housed in Kagel Hall under the direction of a house mother and a trained nurse. They were offered four daily lessons in speech, physical therapy, supervised recreation, remedial reading and arithmetic when necessary, a two-hour general instruction period each day, and swimming. Mrs. Marie Shere was in charge of the program.

The Second Annual Conference on Problems of Impaired Hearing was held July 26 in Syracuse, New York. This conference was sponsored by the School of Speech and the School of Education at Syracuse University.

The all-day conference was highlighted by a luncheon address by Miss Mary Numbers, an outstanding educator of the deaf and supervisor of the Middle School at Clarke School for the Deaf, Northampton, Massachusetts, who discussed 'Recent Developments in the Education of Children with Impaired Hearing.' Other featured addresses on the program were made by Dr. J. C. Steinberg, research engineer with the Bell Telephone Laboratories in New York; Dr. George A. Kopp, director of visible speech research in education at the University of Michigan; and Miss Ann Bunger, instructor in speech reading at the Horace Rackham School of Special Education at Michigan State Normal College. Dr. Kopp, who was formerly head of the Department of Speech at Columbia University, discussed 'The Educational Use of the Speech Translator.' Dr. Steinberg, who collaborated with Dr. Kopp in developing the speech translator, spoke on 'Recent Developments in Speech Aids.' Miss Bunger demonstrated the Jena method of teaching speech reading to the deaf and hard of hearing.

The conference was directed by Dr. Agnes Allardyce, assistant professor of speech and education, and Dr. William Cruickshank, director of special education at Syracuse University.

The Veterans Administration has approved a research problem in statistical analysis of the assembled data from the Army Aural Rehabilitation Unit at Deshon General Hospital. All the medical, audiological and educational data was put on IBM cards and will be analyzed at Northwestern University under the direction of Dr. Raymond Carhart. Dr. Carhart was the Acoustic Physicist at Deshon Hospital.

PERSONALS

Dr. Aram Glorig has been appointed Chief of Audiology, Central Branch of Veterans Administration, Washington, D. C. He is in charge of liaison between the Army Aural Rehabilitation Unit at Glen Forest, Walter Reed General Hospital, and Veterans Administration.

Dr. William G. Hardy resigned July 1st as Director of the Navy's Hearing and Speech Rehabilitation Clinic, U.S. Naval Hospital, Philadelphia, Pa., to accept an appointment on the faculty of the Johns Hopkins University as Associate Professor, Department of Otolaryngology, and Director of Speech and Hearing Rehabilitation at the Medical School. Present plans call for the development of a servicing clinic, a

training course and a research program in terms of the speech and hearing handicaps.

Dr. Karl Wallace has resigned as head of the Speech Department, University of Virginia, to accept a similar post at the University of Illinois at Urbana.

Stanley Ainsworth has accepted a position in Speech Department of Ohio State University. He has been on leave from Indiana State Teachers College, Terre Haute, to do graduate work at Northwestern University.

Dr. Clarence T. Simon will be the Visiting Professor of Speech Pathology at the University of Hawaii from September 1947 to June 1948. His primary responsibility will be the setting up of a speech clinic.

Dr. Georgiana Peacher has recently accepted a position with the Veterans Administration in which she will initiate a speech rehabilitation program with war-injured veterans in the Philadelphia area. Dr. Peacher was formerly Director of the Speech Clinic of the Neuro-Physical Rehabilitation Clinic in Philadelphia.

Miss Eva Thompson, Philadelphia, was awarded a Decoration of Honor by her alma mater, Rollins College, Winter Park, Fla. on June 2, 1947. This citation was in recognition of her research and clinical work in audiology.

Professor Joseph Smith has accepted the appointment as Head of the Speech Department of the University of Hawaii. Dr. Bower Aly, who was the first head of the Department, has returned to the University of Missouri.

Mrs. Elise Hahn will be on the staff of the Speech Education Department of the University of California at Los Angeles. She has been doing graduate work at Northwestern University.

Mrs. Edna Hill Young has recently resigned her position on the faculty of the School of Speech, University of Denver. She is planning to continue private teaching of the motokinesthetic method to teachers in her Los Angeles home. Her new address is: 2342 Scarff Street, Los Angeles 7, California. She hopes to be able to return to Denver for summer teaching.

List of Colleges and Universities Which Conferred the Last Degree Received By Members of A. S. C. A.*

	Clinical Members	*Professional Members*	*Fellows*	*Total*
Iowa, State University of	28	17	29	74
Northwestern University	26	6	3	35
Wisconsin, University of	9	10	10	29
Columbia University	10	4	8	22
Wichita, University of	14	2	—	16
Michigan, University of	8	4	3	15
Louisiana State University	6	6	1	13
Washington, University of	8	4	1	13
Illinois, University of	10	2	—	12
Wayne University	7	4	—	11
Emerson University	9	—	—	9
Minnesota, University of	3	2	3	8
Indiana State Teachers College	7	—	—	7
Ohio State University	3	2	2	7
New York University	4	—	2	6
Southern California, University of	5	—	1	6
Pennsylvania State College	4	1	—	5
Witwatersrand, University of the	5	—	—	5

* This list was compiled by Delyte W. Morris (Ph.D., Iowa), Secretary-Treasurer of the American Speech Correction Association.

	Clinical Members	*Professional Members*	*Fellows*	*Total*
Indiana University	3	1	---	4
Nebraska, University of	3	1	---	4
Rand College	4	---	---	4
Brooklyn College	2	1	---	3
Cornell University	---	1	2	3
Purdue University	2	1	---	3
Western Reserve University	3	---	---	3
Harvard University	---	1	1	2
Kansas, University of	1	1	---	2
Oklahoma University	2	---	---	2
Pennsylvania, University of	---	---	2	2
Syracuse University	1	1	---	2
Utah, University of	1	1	---	2
Western Michigan State College	2	---	---	2
American University	---	---	1	1
Arizona, University of	1	---	---	1
Boston University	1	---	---	1
Bread Loaf School of England, Middlebury College	1	---	---	1
Brigham Young University	1	---	---	1
Capitol University	1	---	---	1
Chicago, University of	1	---	---	1
Colorado State Teachers College	1	---	---	1
Colorado University	1	---	---	1
Converse College	---	1	---	1
Denver, University of	1	---	---	1
Duquesne University	1	---	---	1
Florida, University of	1	---	---	1
George Peabody College	1	---	---	1
Hartford College of Religious Education	1	---	---	1
Humboldt College	1	---	---	1
Hunter College	1	---	---	1
Kansas State Teachers College	1	---	---	1
MacMurray College	1	---	---	1
Marquette University	1	---	---	1
Massachusetts State College	1	---	---	1
Michigan State Normal	1	---	---	1
Milwaukee College	1	---	---	1
Missouri, University of	---	1	---	1
Ohio University	1	---	---	1
Paris, University of	---	1	---	1
Princeton University	---	---	1	1
Rhode Island College of Education	1	---	---	1
Santa Barbara College	1	---	---	1
Slippery Rock State Teachers College	1	---	---	1
Southeastern Mo. St. Teachers College	1	---	---	1
St. Johns University	---	1	---	1
Texas University	1	---	---	1
Tulane University	1	---	---	1
Vienna University, Austria	---	---	1	1
Washington University of St. Louis	---	1	---	1
Wooster, College of	1	---	---	1

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Abstracts of Current Articles

Mary Huber, Editor*

BLACK, JOHN W. and MASON, HARRY M. Training for voice communication. *J. acoust. Soc. Amer.*, 1946, **18**, 441-445.

This article summarizes the results of the four-hour training course which was developed for Army Air Force personnel using airborne interphone and radio communication systems, and compares the over-all results with the improvements in intelligibility that accompanied 'partial' training, particularly in voice loudness and precision of articulation.

The best voice level was found to be the loud voice (short of shouting). Other experiments showed that some variable other than loudness accounted for individual differences in performance. Vocal pitch was found to be related to intelligibility but not in a way that required training, as speakers in airplane noise automatically assumed the best pitch in adjusting loudness of the voice. Rate of speaking was not thoroughly investigated but the training was aimed at 120 words per minute. Added precision in articulation was demonstrated to be attainable with brief training.

The results of the whole training program were found to be better than training in such single factors as loudness, better than experience without training, and quantitatively greater than the improvements produced by the adoption of improved equipment. The program improved selectively those speakers who were originally poorest in ability. (*William J. Temple, Brooklyn College.*)

DUDLEY, HOMER, and GRUENZ, OTTO O., JR. Visible speech translators with external phosphors. *J. acoust. Soc. Amer.*, 1946, **18**, 62-73.

In this type of visible speech translator, the speech analysis is displayed on a moving phosphor-coated belt or drum which is excited by a bank of twelve lamps. Each lamp receives its power from an amplifier fed by one of 12 contiguous bandpass filters. The filters divide the speech band from about 100 to 3600 c.p.s. into sub-bands each about 300 cycles wide. The principle is similar to that of the vocoder analyzer described by Dr. Dudley several years ago.

A translator for individual use, measuring 11x11x7 inches and weighing 17 pounds, was constructed. It showed definite speech patterns, but they were not as legible as desired. A larger, console model and a still larger model for displaying the patterns to large groups of people simultaneously are also described.

All three of these models are regarded as experimental. Further investigation will be necessary to determine where improvement is needed, after which this type of translator will be compared with other types for advantages and disadvantages. (*William J. Temple, Brooklyn College.*)

EGAN, JAMES P. and WIENER, FRANCIS M. On the intelligibility of bands of speech in noise. *J. acoust. Soc. Amer.*, 1946, **18**, 435-441.

Articulation tests were conducted with 13 bandpass transmission systems which passed frequency bands of various widths and three different center frequencies, masked by two different noise spectra. The acoustic gain of each of the bandpass systems is expressed in terms of orthotelephonic gain, i.e., the ratio of the level produced at the listener's ear by the system under test to that at the listener's ear when speech is transmitted from talker to listener over a one-meter path in free air.

The data secured from these tests are presented first in such a way as to show the relation between articulation scores and orthotelephonic gain, and then in the form of families of equal-articulation contours. Finally, a single representative family of contours is derived which gives approximately the relations among band width, relative gain, and articulation. These contours may be used to show, for example, how the gain must be changed for a given change in band width in order to maintain a constant articulation score. (*William J. Temple, Brooklyn College.*)

HAEUSSERMANN, E. Training for independence. *The Crippled Child*, 1946, **24**, 39.

The advances made in the rehabilitation of the cerebral palsied child are the result of the cooperation of the physician, the occupational therapist, the speech therapist, the teacher, and the family. It is only through the combined efforts of all these workers in the field that a complete process of reeducation can be accomplished.

Miss Haeussermann discusses the importance of physical independence and the acquisition of language and speech. This she does from the point of view of the psychological as well as the physical readiness of the individual. The problems in-

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volved in group training and orientation are discussed and there is a detailed description of speech work to stimulate the desire in the child for adequate communication as well as adequate articulation. (*Doris Trepel, Brooklyn College.*)

KOENIG, W., DUNN, H. K., and LACY, L. Y. The sound spectrograph. *J. acoust. Soc. Amer.*, 1946, **18**, 19-49.

The sound spectrograph is a wave analyzer which produces a permanent visual record of sound spectra. The particular model described performs and records in a few minutes the analysis of 2.4-second samples of speech or other sounds which would require weeks or months of harmonic analysis from oscillograms. The time scale and the frequency scale (100 to 3500 c.p.s.) in these acoustic spectrograms are subject to precise measurement; the amplitude scale is not. Means for providing quantitative representation for amplitudes are to be described in a future paper.

In this model the magnetically recorded sound is reproduced approximately two hundred times while a heterodyne analyzer sweeps through the 3500-cycle frequency range. A stylus records the presence of the various components on electrically sensitive (Teledeltos) paper.

Many spectrograms are reproduced, showing analyses of speech, singing, animal and bird sounds, music, modulated tones, noise of several kinds, and miscellaneous familiar sounds. (*William J. Temple, Brooklyn College.*)

KOPP, G. A., and GREEN, H. C. Basic phonetic principles of visible speech. *J. acoust. Soc. Amer.*, 1946, **18**, 74-89.

Instead of articulation, phonation, and resonation, students of visible speech speak of four types of modulation of the breath stream, namely, start-stop, frictional, vocal-cord, and cavity modulation. Each of these types of modulation contributes a unique feature to the visible pattern. Illustrations of seven types of visible patterns are shown and described in terms of the modulations which produced them. These patterns are called voice bar, resonance bar, fill, voiced fill, stop gap-glottal spike, stop gap-spike fill, and voiced stop gap-spike fill.

The individual sounds of American English are classified in six groups on the basis of the modulations used in their production and their characteristic visible patterns. Photographs of their spectrograms, constituting a new kind of visible phonetic alphabet, are described in the new terminology.

Connected speech contains these units and the transitional patterns that occur between them. The transitional patterns, and a new concept called the *hub*, which is the focal point in reading visible speech, are illustrated and discussed at some length.

A future publication will contain a more complete discussion of these principles which are basic to the legibility of visible speech, and other principles as well. (*William J. Temple, Brooklyn College.*)

KRYTER, K. D. Effects of ear protective devices on the intelligibility of speech in noise. *J. acoust. Soc. Amer.*, 1946, **18**, 413-417.

Three experiments were conducted to determine the effects of V-51 Ear Wardens on the intelligibility of speech heard in the presence of noise. These earplugs attenuate all audible frequencies by 20 to 40 decibels.

When the listening crew was seated 12 feet from the loudspeaker source in a room with reverberation time of 1.6 seconds, the intelligibility of one-syllable words was as high or higher with the ears plugged as without when the noise level was raised to 80 db. or higher (raising the threshold for speech by 60 db. or more). In the presence of less noise the use of the earplugs decreased the articulation scores by a few per cent.

In a quiet, echo-free chamber, it was found that speech 80 db. or more above threshold is as intelligible with Ear Wardens as without them.

The third experiment was conducted with both talkers and listeners in the same reverberant room. The public-address system was not used. When the speech threshold was raised 80 db. by the presence of noise, the articulation scores were just as high whether or not the listeners wore Ear Wardens.

It is concluded that in noisy military or industrial locations, where the noise raises the threshold for speech by more than 80 db., the use of these earplugs will provide protection against the deafening, fatiguing, and annoying effects of the noise without interfering with the reception of speech. In some cases their use would improve speech reception. (*William J. Temple, Brooklyn College.*)

LICKLIDER, J. C. R. Effects of amplitude distortion upon the intelligibility of speech. *J. acoust. Soc. Amer.*, 1946, **18**, 429-434.

Articulation tests of speech subjected to various forms and degrees of amplitude distortion (nonlinear transmission) in quiet and in ambient noise led to the following conclusions, among others: (1) amplitude distortion affects quality more severely than intelligibility; (2) peak clipping appears to be inherently less detrimental than other types of amplitude distortion; (3) asymmetrical peak clipping is less detrimental than symmetrical peak clipping.

As a general principle it is stated that if a communication system has insufficient amplitude-handling capability to pass the

peaks of speech and at the same time to provide an adequate intensity level, maximal intelligibility is obtained by clipping the peaks and using the available power to transmit the remainder of the wave. This principle has been studied extensively in two applications: (1) in the design of radio transmitters, and (2) in the design of hearing aids, in which the amplitude-handling capability of the system is limited by the listener's threshold of tickle or of discomfort. (*William J. Temple, Brooklyn College.*)

McBREEN, ELEANOR. The children's speech class. *Hearing News,* 1946, **14**, 5.

The achievement of intelligibility is the aim of the speech work for the children at the Boston Guild for the Hard of Hearing. The most common problems are sound substitutions, lack of resonance, and the need for surgical and dental attention. Therapy is carried on in groups and individually. General relaxation exercises begin each lesson and then each child is given some specially selected loaded material which will satisfy his needs. A tape voice recorder is of particular value in developing melody patterns. If the child wears a hearing aid, he is given help in the proper use of the instrument. (*Doris Trepel, Brooklyn College.*)

POTTER, RALPH K. Introduction to technical discussions of sound portrayal. *J. acoust. Soc. Amer.,* 1946, **18**, 1-3.

This article describes the origins, growth, purposes, and implications of the research studies in making sounds visible which are discussed in detail in the accompanying papers by Steinberg and French, Koenig, Dunn and Lacy, Riesz and Schott, Dudley and Gruenz, and Kopp and Green.

The advantages of pictures properly displaying the basic dimensions of sound were apparent long ago, but a great deal of patient development work was necessary before the pictures were as good as they are today. It was also appreciated early that sound portrayal for speech studies requires a more detailed pattern than that required for conveying the intelligence in speech. During the war the development of both the detailed and broad pattern types was continued, and a program of experimental training in visual hearing was started.

The possible benefits for the deaf are not yet completely explored. The experimental training so far has been confined almost entirely to the problem of determining the readability of the visible speech patterns. It is highly desirable that there should be set up in the field of deaf education a study to determine the best use of these new principles and the requirements for ultimate machines.

These pictures of sound should also provide a new basis for visual imagery and a common ground for discussion in all of the many fields concerned with sound which now employ artificial symbols and highly specialized terminology. (*William J. Temple, Brooklyn College.*)

RIESZ, R. R., and SCHOTT, L. Visible speech cathode-ray translator. *J. acoust. Soc. Amer.,* 1946, **18**, 50-61.

Speech analysis patterns are made continuously visible on the moving luminescent screen of a special cathode-ray tube. These patterns are similar to those produced by the sound spectrograph except that these are produced instantaneously and continuously and the recording is not permanent. The screen is cylindrical band within the tube that rotates about a vertical axis. Because of the persistence of the screen phosphor and the rotation of the tube, the patterns are spread out so that speech over an interval of a second or more is always visible.

Instead of using a heterodyne analyzer, this device divides the 3500-cycle band into 12 contiguous sub-bands approximately 300 cycles wide by means of bandpass filters. The output of each filter is rectified and filtered and connected successively through an electronic commutator and a d.c. amplifier to the intensity-control grid of the cathode-ray tube. As the electron beam is swept vertically across the screen 333 times per second, the screen is excited so that a visible spectrum pattern is shown in which the horizontal axis represents time, the vertical axis represents frequency, and the brightness at any point represents intensity.

The fundamental frequency of the voice is measured and displayed at the bottom of the luminescent screen as a horizontal band which varies in width as the pitch of the voice varies. The circuit of the pitch analyzer is described at length.

Using the cathode-ray translator, a crew of observers has been trained to read conversational speech at the rate of 90 to 120 words per minute. Work is in progress on the improvement of the speech of a congenitally deaf man by comparing his spectrum and pitch patterns with those of a normal speaker. (*William J. Temple, Brooklyn College.*)

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Book Reviews

Ernest H. Henrikson, Editor*

ALEXANDER, FRANZ, and FRENCH, THOMAS (with nine staff members of the Chicago Institute for Psychoanalysis). *Psychoanalytic Therapy—Principles and Application.* New York: Ronald, 1946. Pp. 353.

This work, probably one of the most important and ambitious publications among the recent abundant American psychoanalytic literature, represents the result of seven years of collective endeavor of the staff of the Chicago Institute for Psychoanalysis to find, define and develop principles of shorter and more efficient techniques of psychotherapy than those developed originally by Freud and used rigidly by his 'orthodox' followers. It is addressed to 'psychiatrists, psychoanalysts, psychologists, general physicians, social workers and to all whose work is closely concerned with human relationships.' It is mainly based on 292 Institute cases treated since 1938 and an almost equal number of private patients. The program was subsidized through a grant by Mrs. Albert D. Lasker.

After a brief survey of the scope of psychotherapy in general and of the development of psychoanalytic therapy, the main principles of psychotherapy arrived at by the authors are defined as: the principle of flexibility (individualisation), the principle of the importance of a corrective emotional experience, and the principle of control and manipulation of the transference relationship. The indications for therapy and the necessary planning are then discussed and the dynamics of the therapeutic process are analysed. This forms the first, theoretical, part of the book. The second, larger and practical (clinical), part gives in eight chapters the various facets of application of those principles in the practical dealing with persons suffering from various neurotic disorders. These chapters were written by various members of the staff and contain interesting case histories and descriptions of the therapeutic procedure which were successfully used according to the principles of flexibility, etc., with comments and discussion of every case.

The results of the extensive studies of the members of the Institute, headed by Alexander and French, in the principles of psychotherapy seem important. Successful psychotherapy, according to their experience, is often possible in a much shorter time than previously thought (especially in psychoanalytic circles). Daily interviews not only are often unnecessary but can be harmful and should usually be avoided. Intervals of one week or more between the interviews have frequently been shown to be of beneficial influence in favoring the process of 'maturation.' The typical 'passive' attitude of the analyst has often to be abandoned in favor of a more active, planning and leading attitude. Early formulation of the patient's problem by the therapist has been shown to be in many cases of paramount importance, and the *a priori* scientific knowledge of typical psycho-dynamic mechanisms (i.e., in asthma, stomach ulcers, etc.) facilitates the treatment greatly. Whereas the 'old' school advocated passivity and a 'laissez faire' attitude, the authors (especially French) stress the necessity of early planning and of 'emotional reeducation.' Instead of purely intellectual insight they lay stress on reliving and on new emotional experience. It is emphasized that a new emotional training is necessary and that the most important changes in the patient are brought on by real life experiences and not by the magic of intellectual understanding or the transference situation within the four walls of the therapist's office. It is explained that the development of a complete 'transference neurosis' during treatment is in many cases not only undesirable but might even be harmful. The treatment itself is defined as a kind of 'corrective emotional experience' or even simply as 'reeducation' (French). The goal of any treatment is 'emotional readjustment, not insight.' Insight itself is considered as being effective only if resulting in an emotional 'readjustment.' Alexander stresses the important fact that beneficial experiences, too, might be 'traumatic' and lead during treatment to sudden improvements similarly as former misfortunes proved traumatic resulting in a neurosis, and he distinguishes between malign and benign traumas. From this point of view the therapeutic procedure might be defined as a kind of 'benign trauma.' The importance of this principle for the therapy of nervous speech disorders, especially of stuttering, seems obvious.

The authors consider 'emotional reeducation' as the latest and most up-to-date phase in the development of psychoanalytic therapy which they divide into five periods (cathartic hypnosis, waking suggestion, free

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association, transference neurosis and emotional reeducation). They state that the tendency to differentiate sharply between 'standard' psychoanalysis and 'more flexible methods of psychotherapy' were finally abandoned since it became obvious that the same therapeutic principles are at work in both methods (French). They therefore think that the newer approach propounded in their book still deserves the name 'psychoanalysis.' This kind of reasoning does not seem quite convincing to the reviewer, since it would imply that any kind of psychotherapy for which a psychoanalytic theory could be developed, should *eo ipso* be called psychoanalytic. In spite of their insistence on being still on 'psychoanalytic' grounds and their abundant use of the usual psychoanalytic nomenclature and phraseology, they have actually successfully broken through the walls of many time-honored, dogmatic beliefs, and reached the 'free grounds' of an unorthodox psychotherapeutic wisdom as preached years ago by eclectics like Alfred Kronfeld, Adolf Meyer and Oscar Diethem, or by heretics and early psychoanalytic dissenters like Wilhelm Steckel and Alfred Adler. The authors themselves consider their work as having developed from ideas first proposed by Rank and Ferenezi. They obviously have omitted to give due recognition to authors outside of their own school who have successfully described and applied similar principles of psychotherapy long before the publication of this book. But, in spite of these 'ideological' shortcomings, it must be recognized that seldom has there been a more earnest attempt made to arrive at a profound understanding of the finer psychodynamic principles underlying the process of mental healing. From the point of view of orthodox psychoanalysis it actually represents a revolutionary (or heretic) deed.

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POTTER, RALPH K., KOPP, GEORGE A. and GREEN, HARRIETT C., *Visible Speech.* New York: Van Nostrand, 1947. Pp. 441.

The principle aims of the research department of the Bell Telephone Laboratories, according to its president, Oliver E. Buckley, are the improvement of the telephone and the extension of its service. In the hope of making the telephone available to the totally deaf research was started in 1941 on a mechanism that would portray speech sounds visibly. The preliminary announcement of this research appeared in the magazine *Science* for November 9, 1945. In that article, R. K. Potter, Director of Transmission Research at Bell Laboratories, described a mechanism called the 'sound spectograph' which translated sounds into visible patterns. These patterns the researchers called 'visible speech.' Mr. Potter's article provoked tremendous interest because through the use of the sound spectograph it now appeared possible to depict speech sounds in a manner in which they could be both recognized and interpreted through the eye. There appeared, at the outset, to be many uses for the instrument outside the realm of its original intent, particularly in the fields of speech and deaf education. Research minded workers in both fields were more than mildly excited over its possibilities. Since the original article appeared, research on the mechanism itself has continued at the laboratories under the direction of Mr. Potter. Work was also started under the direction of George A. Kopp and Harriett C. Green on applications which might be made to some of the problems involved in teaching speech to the profoundly deaf. This latter research has been carried on during the last year at the University of Michigan and at Michigan State Normal College.

The book, *Visible Speech,* written by Potter, Kopp & Green, which came from the publishers in June, 1947, appears to be a report on progress both in the development of the mechanism itself and on its use, as of now. The point of view of the authors of the book seemed to this writer to be summed up when they said, 'We have attempted to emphasize the experimental nature of the development and to avoid both dogmatic or arbitrary statements concerning present evidence and information. The tentative nature of our conclusions, principles and concepts cannot be overstressed.' It is further emphasized that the book is meant to be a textbook and should enable anyone interested to learn as much about visible speech as is possible through the medium of words and pictures. It seems to the writer that the authors have done an admirable job.

The text itself is preceded by Part I which contains a description of the sound spectograph and the direct translator which enable the deaf to carry on conversations directly, over the telephone, or to see radio speech. Also in Part I is an account of the preliminary training program carried on at the laboratories with five young women with normal hearing which was set up to ascertain the possibilities of simply reading visible speech. Later there was added to this group a man who had been deaf since childhood. These introductory chapters also include definitions which the research workers feel will be helpful in enabling one to follow the speech patterns and the phonetic principles upon which they are built.

Part II is composed of Lesson Units which are designed as a text for learning to read visible speech. The Lesson Units are clearly and logically developed. For example, each consonant classification is handled

in a separate chapter. The stopped consonants are given as the first group. Each consonant lesson is presented in this manner: A description is given first of how the sound is made in the mouth. The verbal description is accompanied by a simple diagram which does much to add clarity. Visible patterns of the sound in isolation are succeeded by the consonant followed and preceded by several vowels, showing how the pattern changes. A concise summary showing how the surd consonant differs from its sonant cognate and a summary of the outstanding visible characteristics of each sound concludes each lesson unit. Two pages of review words accompany each unit summary.

Part II, or the text proper, contains seven chapters, each being made up of units similar to the one described above. It is the belief of this writer that the authors have added materially to the possibilities that visible speech will be used by the concise manner in which each lesson unit is organized. If it is possible to learn to read the patterns from a printed page, it seems possible to learn to read them through the lessons set forth in this book.

Part III concerns itself with the applications of visible speech. The principle interest of the research workers at the moment appears to be in finding answers to the following questions:

1. To what extent can visible speech facilitate speech education and speech improvement?

2. To what extent can visible speech be used to advantage as a means of communication in the general education of the deaf?

It is hoped by those working with visible speech that it can be made applicable to the development of speech in pre-school deaf children. The hope is built on the assumption that speech should develop more normally with the visible pattern, and that later speech correction would not be so arduous as it is now with present methods. To this writer, the theory is sound but there is a question about whether the patterns may not be too difficult for such little minds to grasp. Developments along this line will be very interesting.

A chapter in Part III is given over to the application of visible speech in the field of speech correction. Work in this area is in progress at the University of Michigan. A report on progress to date is included.

The remainder of the areas in which visible speech has been thought to have application are still in a more or less speculative stage of development. Patterns are given of various languages other than English, including Chinese, Russian, Arabic and others. An application to the study of animal sounds is discussed. The last chapter questions the possibility of using visible speech in the study of vocal music.

As one reads this book one has the feeling of being invited to participate in a research project of almost mammoth proportions. The book is most interesting and worthy of study especially on the part of those working in the fields of speech and deaf education.

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